THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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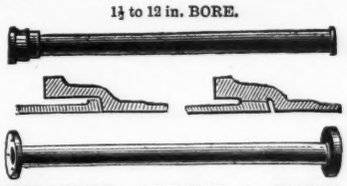

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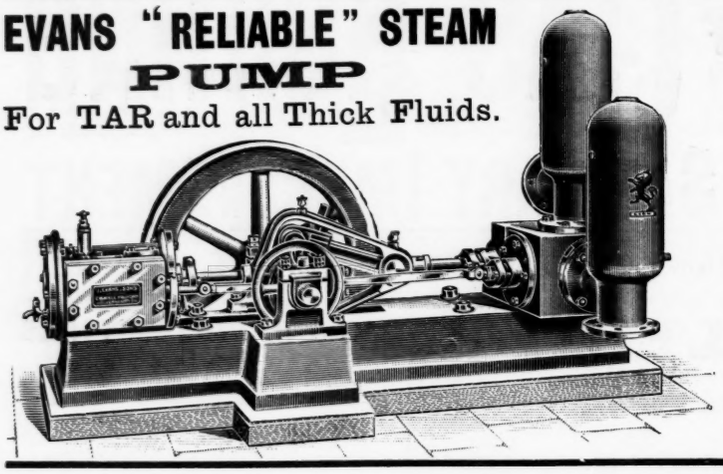

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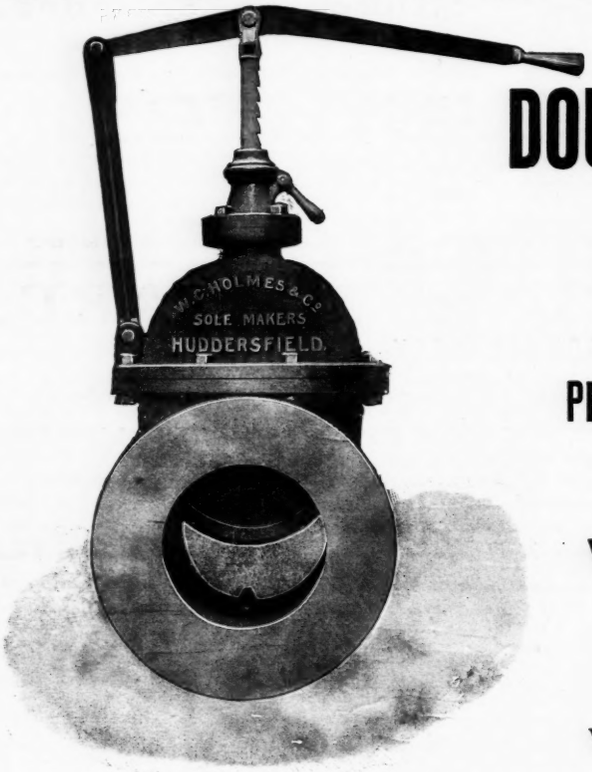

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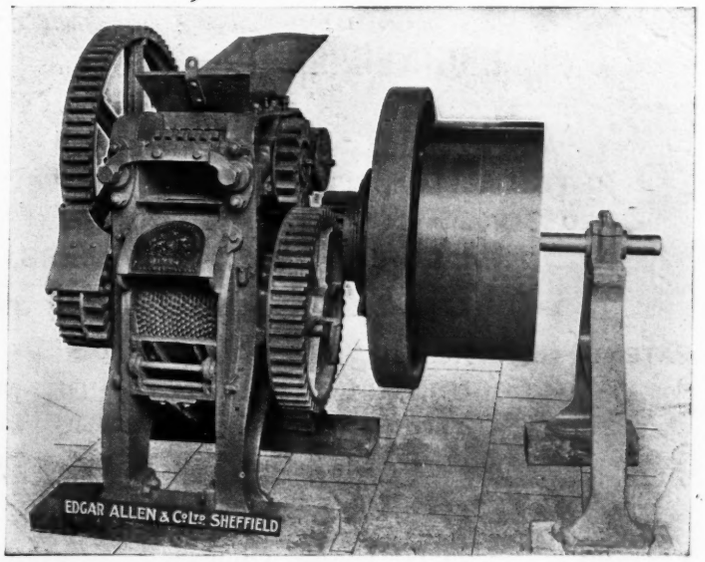

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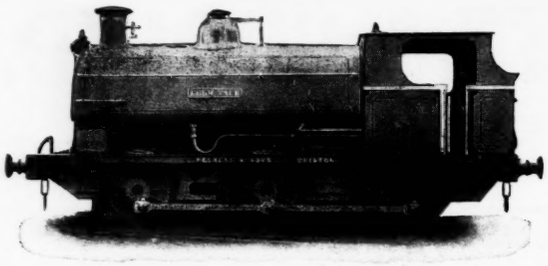

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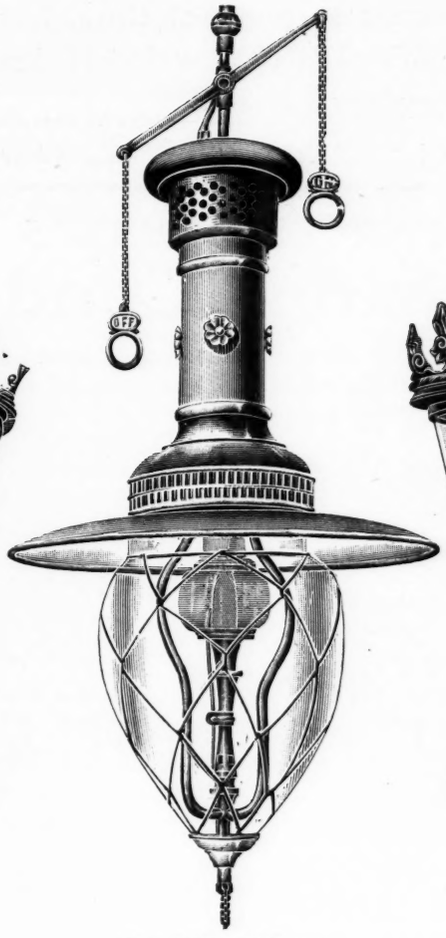

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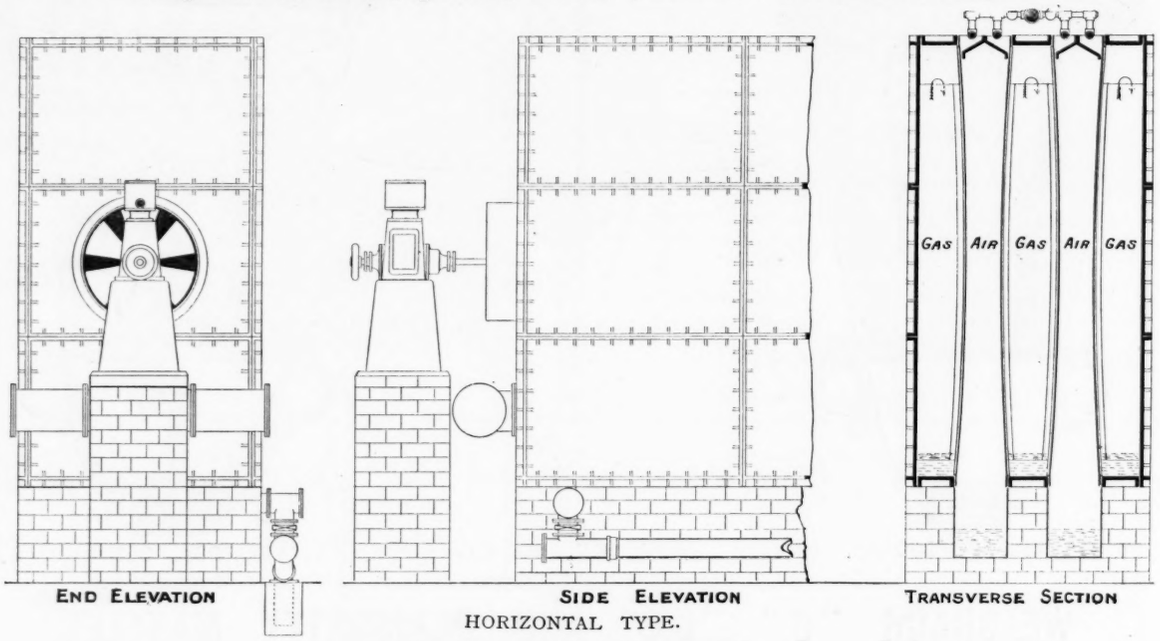

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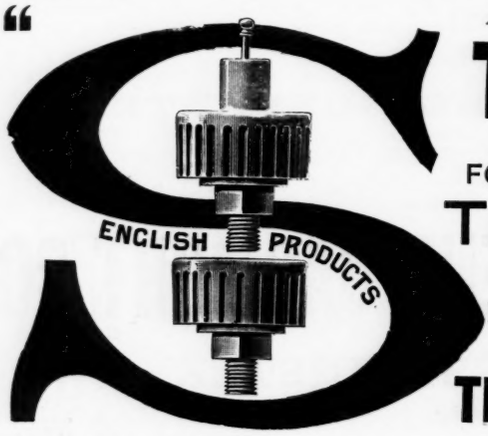

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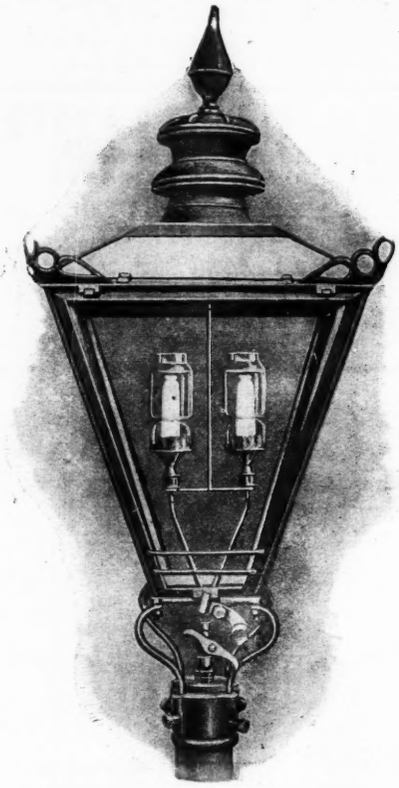

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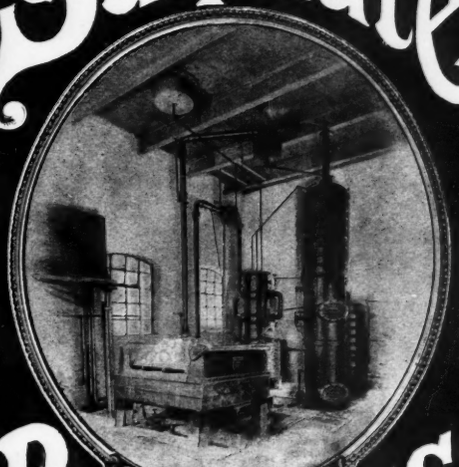

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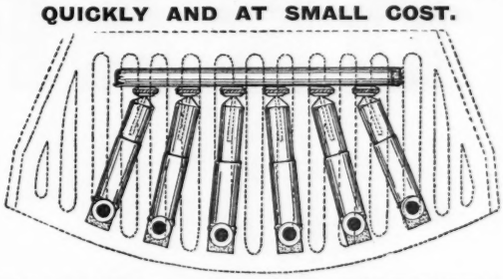

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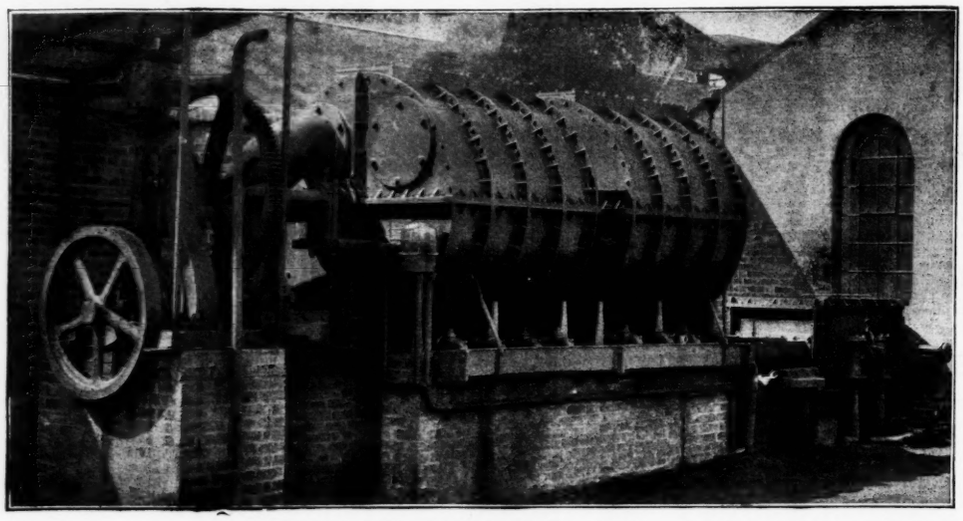

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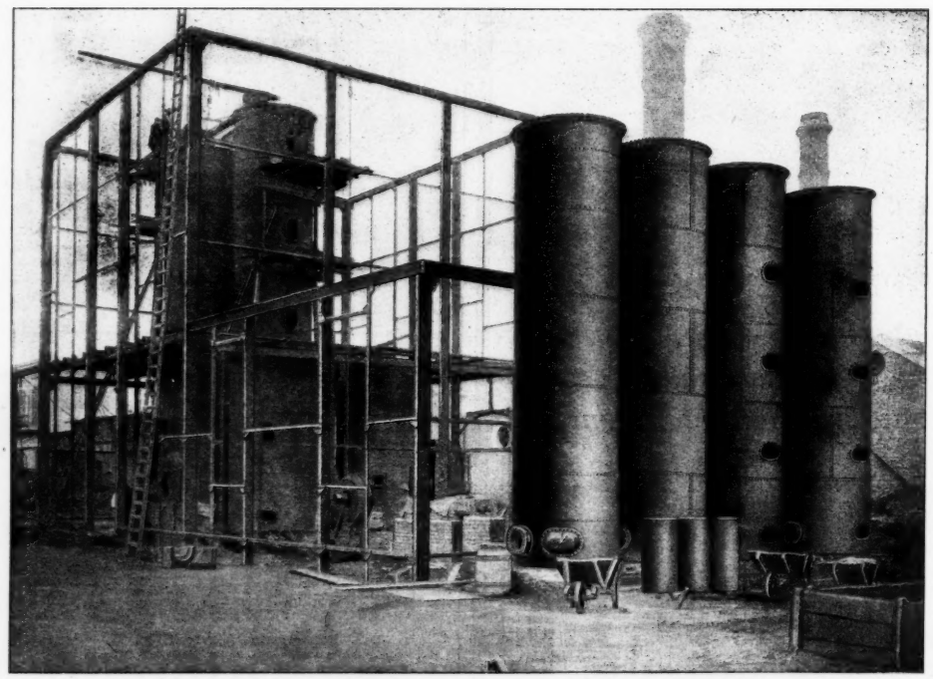

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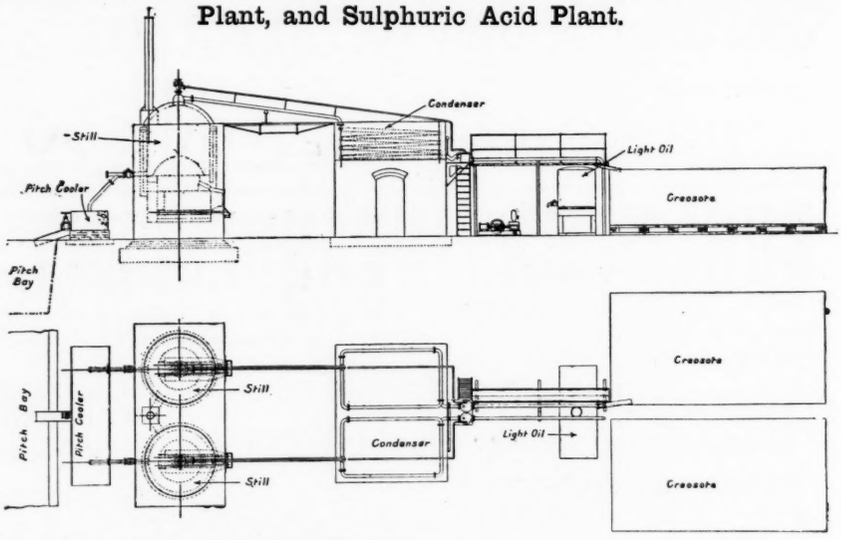

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CONTENTS.

EDITORIAL NOTES.

GAS, &c.—

Inverted Gas-Burners and Flame Arc Lamps 225
London Traffic 225
Ironmongers as Agents 226
The Visit of Paris Municipal Councillors to London—A Missed Opportunity—Political Local Administration—Sensational Elective Auditors—Sir A. Rollit on Municipal Affairs—Electric Cooking and Heating—Monazite—Motors for Carting Coke, &c. 226

Gas Stock and Share Market 229
Electric Lighting Memoranda 229
The Lighting and Subways of Aldwych and Kingsway 231
Gas Acts for 1905 232
Analysis of Ammoniacal Liquors 233
The Prejudice against Gas-Fires and Some of the Causes. By E. D. W. 235
The Thermometer as a Gauge of Economy in Coal Consumption 236
Inverted Gas-Burners. By Professor H. Drehschmidt. 237
Manchester and District Junior Gas Association 238
Artistic Lustre for Inverted Lights. . . . 239
Italian Gas Society—Offer of International Prizes 239
Mechanical Filters at Brooklyn (N.Y.) . . 240
The Reservoir Catastrophe in Madrid. . . 241

LEGAL INTELLIGENCE.

Lambeth County Court—Vogan and Others *v.* South Metropolitan Gas Company—Disputed Meter Registration 247
A Question of Liability for Pollution . . . 248
Cutting Off a Tenant's Gas Supply . . . 248

REGISTER OF PATENTS.

Gas-Producers—Cerasoli, A. 242
Fluid Meters, Motors, and Pumps—Sharp, J.. 242
Obtaining Bye-Products in the Dry Distillation or Gasification of Fuel—Koppers, H. . . 242
Pressure Reducing Devices for Gas—Anderson, J., and Bennett, J. H. 244
Burners for Obtaining Light and Heat—Bower, G. 244
Incandescent Gas-Mantles—Thorn, A. . . 244
Cock for Prepayment Gas-Meters—Dupoy, J. R. 244
Anti-Fluctuating Gas Supply Apparatus—Keith, J. & G., and Collinson, A. . . . 245
Air and Gas Regulators for Incandescent Lamps—Schuppisser, H. 245
Gas-Cocks—Weickart, T. H. W. 245
Automatically Lighting Gas Lamps--Kissil, W. 246
Prepayment Gas-Meters—Clarke, C. A., and Rossiter, W. 246
Liquid Meters—Hagspiel, W. 246
Patent Notices 247

MISCELLANEOUS NEWS.

A Missing Gas Collector 247
Curious Position of the Portsmouth Board of Guardians 247
The Street Lighting of Liverpool 248
The Price of Gas to Manufacturers in Birmingham 248
Gas Exhibition at Newport (Mon.). . . . 249
Light Railway Construction and the Protection of Gas-Mains 249
Croydon Gas Company and Local Ironmongers Agreement as to the Supply of Gas-Stoves 250
Cost of Heating by Gas and Electricity . . 251
Politics in Gas Affairs at Bradford 251
Gas at the Brewers' Exhibition. 251
Sale of Gas Stocks and Shares 251
French Municipal Councillors at the Hampton and Staines Water-Works 252

MISCELLANEOUS NEWS (*continued*)—

Liverpool Corporation Water Supply—A Second Pipe-Line from Vyrnwy 252
Shrewsbury Water Supply—The Upland Scheme Favoured by the Ratepayers . . 253
Notes from Scotland 253
Gas-Works Extensions at Burnley 254
Stock and Share List 254
Current Sales of Gas Products 255
Coal Trade Reports 256
Inspection of the Oldham Gas-Works . . . 256

PARAGRAPHS.

Conference on Smoke Abatement 228
"Gas and Oil Power" 232
Sulphate of Ammonia as a Manure—Yorkshire Junior Gas Association 236
Travelling Platform over Retort-House Subways—London and Southern District Junior Gas Association—High-Pressure Gas and Inverted Lights 239
Cheaper Gas for Power at Smethwick . . . 248
Louth Gaslight Company 251
Launceston Gas Company and their Water Supply 253
Proposed Purchase of the Weston-super-Mare Gas-Works 254
Fatal Fall from a Gasholder at St. Helens . 256
New Water Supply for Holyhead—Aberavon Gas Supply—Automatic Meters at Beccles—Charge for Gas for the High-Pressure Refuge Lamps in Westminster—Padiham Gas Supply—Assessment of the Nantwich Gas-Works—Duty of Protecting Public Gas-Lamps—Gas Explosion at Chesterfield. . 257
Reduction in Price—Chard Water Supply—Electric Wires and Fire Risks—Ceara Gas Company, Limited - Fire Caused by Electric Current—An Unfortunate Investment in Consols—A Gas-Fitters' Association for Birmingham—Local Authorities and the Wiring of Premises—Death in a Bath . . 258
Gas Fumes and Stained Glass Windows . . 259

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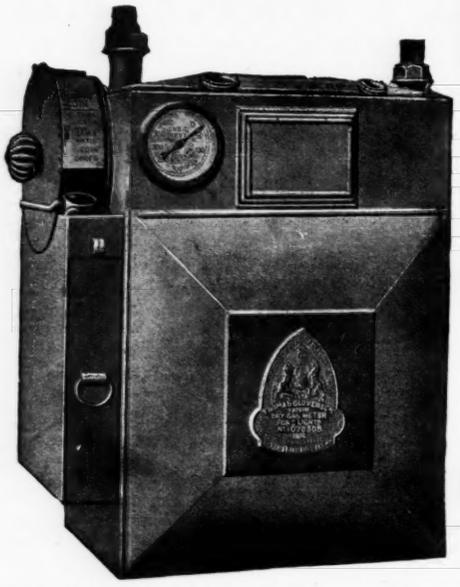

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. XCII., No. 2215.—TUESDAY, OCTOBER 24, 1905.

EDITORIAL NOTES—GAS, &c.

Inverted Gas-Burners and Flame Arc Lamps.

THE diligent and practical researches of Professor Drehschmidt, Chemist of the Municipal Gas-Works of Berlin, have done much to enrich the literature of the gas industry; but we do not think any more opportune investigation has ever been made by him than that, of which we complete the account to-day, into the behaviour as illuminating agents of inverted gas-lamps. In this country in these matters, we are too much in the habit of contenting ourselves with the value of the illuminating duty, taken on the horizontal plane, per cubic foot of gas consumed in any given burner, and judging of the relative values of lights from this bare standard. Professor Drehschmidt moves our interest beyond this; and let it at once be said here that, if readers will but take the trouble to peruse the article in last week's and the current issue of the "JOURNAL," they will then be in a position to derive from the tables published on July 11 last (see p. 101) some valuable information—information which shows that scientific research proves the gas industry has, in the newer forms of the inverted gas-burner, a practical method of giving light which places at a disadvantage (apart from any question of cost) all the modern progress made in electric lamps in respect of the useful distribution of light. This superior distributive power widens the range of application, even to the realm of street illumination, over which our friends of the electrical world are for the moment in a somewhat feverish state of excitement. They deride, but under the derision there is only the feeble support that is rendered by hypothetical and unscientific assertion; while opposed to it is not only the visual test supported by scientific proof, but public opinion and the infallible test of the relative drain on the public purse.

Here, in this study by Professor Drehschmidt, we have it demonstrated that the inverted incandescent gas-burner can excel when properly applied for street illumination; and what is of more than passing interest, the flame arc, though it emits all its light downwards, is stated by this authority to be inferior to the inverted gas-burner, because it has too little lateral power. The electrical industry just now is paying servile homage to the flame arc lamp, which (it has been our opinion ever since its introduction experimentally into the City of London) is more meretricious than useful for general illumination. Close by the Mansion House and by Blackfriars Bridge are the exponents of a definite local brilliancy though the lamps are closely grouped. Professor Drehschmidt confirms this great localization of power. He employs no qualification nor ambiguous terms, but says distinctly the flame arc light "is only "adapted for lighting powerfully a small area directly under "it, and is not fitted for a more general illumination, either "of rooms or streets." This being the case, then the flame arcs for lighting surfaces longitudinally (as in streets) must be worse than the ordinary arcs, which are bad enough unless their distance apart is greatly shortened from what is the practice. Whether the Professor takes the Osmium or the Nernst lamp or the ordinary electric arc, he cannot find one form of electric lamp that can compare with the distribution of the light of the best types of inverted gas-burner.

Prior to reading the full text of Professor Drehschmidt's account of his investigations, the hope had been expressed in the "JOURNAL" that it would not be long before a substantial trial was made in the lighting of a roadway by the inverted gas-lamp; and it is therefore interesting to observe that practical trials have been undertaken in the streets of Berlin. If similar tests are instituted here (as we trust they will soon be), the blunder originally made in the German capital, of putting the inverted burners in the old street-lamps, must not be committed. The account of the Berlin researches into the light-distributing power of the inverted gas-burner, and the comparison with other lights, is welcome at this time; and no gas engineer or manager will be abreast of contemporary knowledge of lighting matters who does not give to Professor Drehschmidt's latest work the earnest attention it deserves.

London Traffic.

THERE is every prospect that much of the time and money expended over the inquiry by the Royal Commission on London Traffic will have been to no beneficial purpose, though it is to be hoped that from the balance something useful will accrue towards alleviating the congested condition of London, so that some amount of merit for the Commissioners, and justification for their inquiry, may be handed down to posterity. When the first volume of the Commissioners' report made its appearance, it was sufficient to convince the practical man that the work of this particular Royal Commission would pass as an addition to the already large accumulation of similiar inquiry, the extensive verbal results of which have earned no more substantial memorial than their Blue-book record. The report of the Advisory Board of Engineers to the Commission, though out of numerical order, has now been issued in book form; and the most that it does—it may be said with the greatest respect for the eminent Engineers constituting the Board—is to confirm the reasonableness of the merciless criticism showered on the Commissioners' own report as to the impracticability of their schemes in main aspects.

Faculty to plan on the splendid scale is within most men when payment for the work suggested rests with others; and truly the Advisory Board have well demonstrated this in their report, which the Commissioners themselves have practically adopted. The ratepayers will look very sceptically at the benefits they are promised by the expenditure of anything between 24 and 30 millions sterling for the construction of two great central main avenues through London, from East to West and from North to South, with subterranean tramways and accommodation for gas and water pipes in tunnelling. The report does not make it clear how these arterial ways through London are going to relieve the local congestion, as it seems that they are to pierce London in those parts where we have already the broadest and most magnificent thoroughfares. The widespread congestion is not confined to Central London. The millions that are proposed to be spent in this way would, to a large extent, leave tributary thoroughfares still in a congested state, though the widening of some of the present main roadways and the provision of subways in them are in contemplation. Tramways and railway projects come within the report; but it is on the whole disappointing. It is attractive only in the grandeur of its conception—nothing more. While it impresses in this way, the cost oppresses; and bold will be the authorities of London who will dare to court the imprecations of the ratepayers by seriously proposing the materializing of these projects, at such cost, with over and beyond the great unknown cost that will come upon the trade of the Metropolis through the years of tribulation that will have to be passed during the prosecution of the scheme. A scheme partaking less of the wonderful, and aiming at the relief just in those main centres where congestion is most acute—such as the improvement produced by Kingsway and Aldwych—would unquestionably have had a sympathetic reception. The mention of Kingsway and Aldwych allows us to remind readers that this newest of London's great thoroughfares is lighted by high-pressure gas-lamps. This is significant of municipal opinion in the Metropolis.

There is one part of the Engineering Board's report that it may be hoped will have good effect, and that is where condemnation is made of the practice of placing lamp-columns (as is so greatly preferred by the electricians) and trolley-wire standards in the centre of roadways; thus converting a really decent thoroughfare into two narrow and

inconvenient lanes. But, after all, the Advisory Board do not appear to entertain great hope of any heroic or systematic treatment of London until all questions affecting the roadways and traffic are entrusted to a central authority. It is the decentralization of authority that, in their opinion, has brought about the existing chaotic conditions; and centralization, in their judgment, is the first step towards betterment, but not—the opinion is general—on the colossal lines advanced by the Board.

Ironmongers as Agents.

"Step by step one goes a long way" is a precept with which the ironmongers of the country have evidently some acquaintance. Through their Association, they are working to get back some of the gas-fittings business that they lost years ago through negligence, and when it was a pretty common view that gas was on its last legs. Things have been reversed; and the ironmongers now tell us there is not much for them in electrical fittings and the fixing work. Consequently, they are desirous of inverting the usual order of things, by being "off with the new love, and on again "with the old." There was a little reconnoitring on their part at the Earl's Court Gas Exhibition, to see how their advances would be received; and from that time they have been winning ground in rehabilitating themselves in the affections of those in authority in the gas industry by working with circumspection to gain their end. Their attitude towards municipal gas undertakings (they could not say much to gas companies) of but a few years ago, when antecedent mistakes and omissions were recognized, was the hopeless one of stand-and-deliver. That, of course, was more than any municipal department could possibly endure after having, without costing the ratepayers a penny, greatly expanded their gas business by the auxiliary means when those means were absolutely being neglected by those whose special business it should have been, in their own interests, to encourage the custom of the gas business. But the ironmongers having now shifted their stand to the lower ground upon which they show a willingness and desire to trade in conjunction with the gas suppliers to mutual advantage, a new aspect is given to the question; and there is no doubt that many gas suppliers will as a result be disposed to look with a more tolerant spirit upon any further advances that are made.

There are, of course, reasons why the ironmongers can never fill the same position in developing the use of gas that gas suppliers, whether company or municipal authority, at the present time occupy. There is not a single ironmonger who can afford the capital and the space for the purchase and display of such a selection of gas apparatus that gas suppliers can; and it is this large selection, the large display, the ability to supplement stocks by all the new styles in design and types in efficiency, that give gas suppliers a pull over the ironmonger, to the benefit of their gas business, and to the satisfaction of their customers. But as Croydon and other places are now showing, there are ways and means by which ironmongers can be made authorized agents; their shops, the branches of the central depôt as represented by the gas undertaking's show-room; and the show-room, a place in which the ironmonger can prosecute business in gas appliances, and a store from which he can supply his customer with any desired gas fitting or gas appliance. Ironmongers in such a position are better off than those who work unattached. We publish to-day the Memorandum of Agreement whereby the ironmongers of Croydon may become the recognized agents of the Gas Company. This document has been the subject of considerable deliberation; and it has been framed entirely with the view of establishing a really workable arrangement between the Company and the ironmongers. Croydon was a particularly fit place for the formulation of an agreement of the kind, seeing that if anyone has an uncommon amount of knowledge on all matters affecting the purchase and sale of goods such as ironmongers deal in that one must be, through the vastness of his special business experience, the Chairman of the Croydon Gas Company (Mr. Charles Hussey, J.P.); and he with the Company's Engineer and General Manager (Mr. James W. Helps) and the Secretary (Mr. W. W. Topley) form a trio to whom such a matter as this could be with great certainty left for its proper development from all points of view. We do not know that this was really done; we simply look at the comprehensive and fair bargain as it is presented in the agreement, and draw conclusions from the amalgamation of that agreement and other known facts.

Being printed in full, there is no necessity to traverse the terms of the agreement, more particularly as we hold, and shall continue to hold unless other critics can substantiate defect, that it is a model of an agreement for this purpose. It safeguards all interests; the terms are encouraging to the ironmongers; and the business of the Company will be the better for the opening up of direct contributory branches throughout the district. The great railway companies find this; and why should not gas undertakings? Of course, the most pronounced result in advantage will be secured where the encouragement is the greatest; but there must not, at the same time, be any loss of control of business or supervision of work. Without offence, we may say that the Croydon agreement is infinitely to be preferred to the arrangement that has been made at Nottingham, as reported last week. The Corporation are not to let out on hire any gas fires or radiators; and no internal work is to be done by the Corporation beyond the meter. There is no doubt about it that the Nottingham Corporation Gas Department have met the ironmongers in a very generous spirit; and in those two respects, we think, they have shown a greater liberality than the encouragement of business through the ironmongers demanded. We will not cast about for the explanation of why the Gas Department put upon themselves disabilities which may in the future, if not in the present, prove somewhat irksome, and may be used to their detriment. There are so many things that sway the doings of our local governing bodies.

The Visit of Paris Municipal Councillors to London.

As most of our readers are aware, about sixty members of the Paris Municipal Council paid a visit to London last week, at the invitation of the County Council, of whom they were the guests—each member taking personal charge of one or more of the visitors, instead of allowing them to house themselves at one of the large hotels. The event was, so far as we remember, unexampled in the municipal history of the Metropolis. It is true, as Sir Homewood Crawford has reminded us, that just thirty years ago the Corporation of London had the honour of entertaining at the Guildhall municipal representatives from a large number of cities and towns on the Continent, in Canada, and in the United States, who were joined by the Lord Mayors of Dublin and York, the Lord Provosts and Provosts of Scotland, and the Mayors of the United Kingdom. But the gathering was a very different one from that of the past week. The London County Council were naturally proud of their latest achievement in the way of improvement by the removal of a number of "slummy" streets in the neighbourhood of Drury Lane, and the construction of a fine broad thoroughfare leading direct from the Strand to Holborn. The surface of this new road the Council have—wisely, in our opinion—lighted by high-pressure incandescent gas; and underneath they have constructed a shallow subway, through which electric trams will run down to the Embankment level. It was primarily to witness the ceremony of opening this roadway, by His Majesty the King, last Wednesday that the Paris councillors were invited; and the occasion was deemed a suitable one for giving them an insight into some of the municipal work of London, and the personal qualities and private life of those who are entrusted with it, as well as into the character of English hospitality. The programme prepared for the visit was naturally practically restricted to inspections of works in the hands of the County Council; but opportunity was taken on Friday, when the French councillors went to Windsor, to accept an invitation extended to them by Sir Melvill Beachcroft, the Chairman of the Metropolitan Water Board, to call at Hampton, go over the water-works, and afterwards proceed to Staines to see the spacious reservoirs and pumping plant there. The Chairman gave the visitors some highly instructive particulars in regard to the water supply of London, which they were able to carry away with them in a pamphlet in their own language prepared by Mr. W. B. Bryan, the Chief Engineer of the Board.

A Missed Opportunity.

In view of the fact that in about two months the concession of the Paris Gas Company will expire, and the control of the

supply will pass into the hands of the Municipality, it seems almost a pity that the councillors could not, when they went down the Thames to the Blackwall Tunnel and the sewage outfall at Barking, have stepped ashore at Beckton or at East Greenwich and learnt something about the extent of the gas supply of London. Whether the municipal control of the works in Paris will in the future be direct or indirect is even now, at this late period, a matter of uncertainty; the Chamber of Deputies and the Senate not having been able to settle their differences of opinion on this question. In any event, a little information on the subject of gas making, though not emanating from municipal bodies, might have been serviceable. The visitors would have learnt that, under the management of Companies, gas is supplied in London at an average price of 2s. 6d. per 1000 cubic feet, or about 11c. per cubic metre, compared with 4s. 6d. (20c. per cubic metre), and until a year or two ago 6s. 9d., in Paris. The Company whose concession is expiring were handicapped in their dealings with the consumers by having to share their profits with the Municipality; but they must nevertheless be credited with introducing modern systems of supply, such as the free installation of burners and cookers, which have been largely adopted. The Municipality have obtained control of the gas-works ostensibly in the interests of the consumers. Let them, therefore, show that this was really their object by bringing the price down to something more closely approximating those charged in London. There are many things in respect of which we may usefully take lessons from our friends across the Channel; but the supply of gas is not one of them. On the contrary, we venture to think that some lessons on the subject might be learnt from this side. There is evidence that the consumers are tired of the present *régime*, and are looking to the Municipal Council to introduce reform.

Political Local Administration.

This is the time of the year when the voice of the candidate for municipal honours is heard in the land; and consequently the columns of the newspaper Press are to a considerable extent occupied with the reporting of those who are seeking to represent some section of the ratepayers in the local Parliament. In this way, no doubt, prominence is given to a good deal of talk which is not in the least bit worthy of it; but that, unfortunately, cannot be helped. It is necessary for the voters to learn the views of the respective candidates, if they are to exercise their privilege—that is, supposing they take sufficient interest in local affairs to do so at all—in a responsible manner. But it is to be feared that too often support is given or withheld, not because of the suitability or otherwise of a particular aspirant to membership of a local authority, but because of the political party to which he owes allegiance. At least, this would appear to be the case judging from the number of speeches that are delivered in which the Liberals or the Conservatives—as it may happen to be—are held up to execration or to praise. A notable instance of this is reported from Bradford, where the Liberal Association have issued a long statement dealing, among other things, with the administration of the affairs of the local gas undertaking. From this it appears that, whatever else they may be able to do (and probably the Association in question would argue that they could do nothing at all properly), the Tories are utterly unable to manage a gas-works. This is, of course, absurd; and it is time that the ratepayers protested against such a method of treating public affairs. If the best men are selected for seats on the Council, it must be a pure accident whether they happen to be Liberals or Conservatives; while if the members are elected on the strength of their party colours, it must equally be an accident if those chosen should happen to be the best fitted to look after the interests of the electors. It may possibly be advisable for a local authority to be roughly divided into two sides on questions of general policy; but even if this is so, it cannot by any stretch of imagination be urged that the same rule should apply to the administration of a trading concern. In Bradford, it is made to appear that because the Liberals were in a majority during certain years, the price of gas was reduced 5d. per 1000 cubic feet; while in Leeds the Tories are being widely blamed in connection with the recently revealed shocking state of affairs with regard to the Colsterdale reservoir scheme. If there were anything in these arguments, we should expect to see gas and water officials selected for positions, not solely for their knowledge of the business, but also on account of the political party to which they belonged. We know, however, that an engineer seeks to obtain a berth on his own merits; and it is impossible to understand why a man should not be chosen as a councillor on exactly the same grounds. Only last week we had to report the intention of the Deputy-Chairman of the Liverpool Water Committee to send in his resignation as a member of the Corporation, "because it appeared that the Council Chamber was now used as a mere debating ground for politicians, rather than for carrying out the honest work of the town." It is to be hoped that this protest may be productive of good, and that as time goes on less and less may be heard, in connection with municipal elections, of statements that—"The Liberals did so and so;" and "The Conservatives were responsible for something else."

Sensational Elective Auditors.

And just when the municipal campaign is in full swing, ratepayers are being treated to some "tit-bits" in the shape of statements by Elective Auditors, which are, one would think, well calculated to render council work distasteful to just the class of men whom it is most desirable should take part in it. Of course, the irrepressible Mr. S. Norbury Williams is well to the front with particulars regarding "dinner bills" of the Manchester Corporation; this being a subject which admits of a good deal of cheap fun, and so is likely to catch the popular fancy. The fact that a dinner is given to the Home Office representative on the occasion of his annual visit to inspect the police, is considered of sufficient importance to warrant the publication of the items included in the account—even down to "gooseberries at 6d. per pound." The Gas Committee's dinner of about a year ago also—as was only to be expected—comes in for its share of attention, as does what Mr. Williams terms a "double feed" of the Improvement Committee. Yet the writer himself proves the real insignificance of the few pounds spent in the way that he complains of, when he remarks that the business of the Corporation has now become stupendous, and that the money and cheques which come into, and are paid out of, the Treasurer's office in the course of a single year amount to the enormous sum of £13,500,000. Another Elective Auditor who has devoted a quite unnecessary amount of attention to "junketing" by town councillors is Mr. J. W. T. Morrissey, whose duty it is to go through the Liverpool Corporation accounts. Dealing with the cost of luncheons on the occasions of inspections and deputations, this gentleman is good enough to remark that "it is satisfactory, from the ratepayers' point of view, to notice the moderate scale upon which these luncheons were arranged, compared with what was customary four years ago, before the public were made aware of the fact that such functions took place at all. It will be found that the cost has been reduced by about one-half; and I think we may reasonably assume that this reduction has been effected without any loss of dignity to our city or lessening the usefulness of the work of the deputations. My own opinion is that it should rather tend to enhance the value of the work, as the less drink consumed by these gentlemen, and the plainer their mid-day meal, the more likely are they to be alive to the practical details of the various undertakings, and the keener to notice, in the interests of the ratepayers, any defects there may be in the management or working of these undertakings." Then follow a number of accounts, published for purposes of comparison, relating to charges incurred for refreshments to the councillors and others while engaged on Corporation business. The amounts involved are paltry in the extreme; and yet the payments are all set out as though the financial stability or the municipal purity of the City of Liverpool seriously depended upon them. Mr. Morrissey, it is true, dwells upon the "moderate scale" on which the luncheons were arranged; but his approval is so framed as to render his remarks even more likely to give offence than those of Mr. Norbury Williams to men whose work on behalf of their fellow-citizens merits a better reward than their denunciation as feasters at the public expense.

Sir A. Rollit on Municipal Affairs.

There was little that was new in the address which Sir Albert Rollit, M.P., the President, delivered to the members at the recent autumn general meeting of the Association of Municipal Corporations; but the points dealt with were, for all that, none the less

worthy of attention. There was, for example, the Bill which he introduced (and was subsequently obliged to withdraw, to prevent its being "ignominiously talked out"), at the instance of the Association and the London Chamber of Commerce, for the purpose of putting an end to the present inequitable system of taxation of Companies without representation. The Bill proposed that one representative from each Company should be appointed, under the seal of the Company, to record a vote on their behalf; but, when it was introduced, not another member of the House supported the principle of the measure. The Liberals generally were opposed to the proposal; while many Conservatives said one vote was not worth having, and that there had better be no Bill at all. It remains to be seen whether a Bill having a like object will be introduced into the next session of Parliament; but it is to be hoped something effectual in the direction of righting the wrong from which Companies at present suffer will be accomplished before very long. Sir Albert found occasion to deplore the attitude of the Government departments with reference to the periods for which loans are granted; and he remarked that the attitude of financiers, of some politicians, and even certain Public Departments towards the Corporations is forcing them to borrow in other and more willing quarters. From his experience as Chairman of the Inspection Committee of Savings Banks, he is able to assert that the savings of the working classes, stored in the special Investment Departments, are making their way as loans for local public improvements. Another point touched upon was municipal accountancy; and here the President was able to give his listeners some really sound advice—that the Corporations should have a most careful regard to prevent any pretext for anti-municipal trading attacks by sedulous attention to the question of accounts and audit. The question of a change in the system of auditing has, of course, remained in abeyance since the report (issued a couple of years ago) of the Joint Committee on Municipal Trading; but whatever may be decided upon eventually, the Association of Municipal Corporations do not intend to have Government Auditors if they can possibly help it. Sir Albert urged his hearers to take all reasonable and proper steps to see that the audit is clear and sound and thorough, and that all proper deductions for depreciation and the like which may reasonably be claimed are made. This is exactly what many of the critics of municipal trading have been long clamouring for.

Electric Cooking and Heating.

Mystery continues to surround the question of electric cookery; and conspicuous is the absence of further information in the electrical press this week. Loud talk was, as was shown in our "Electric Lighting Memoranda," prominent enough in the preceding week; but somehow people are difficult to persuade by such means that a commodity costing the users so much for lighting is going to beat in lowness of cost and efficiency all known and well-tried methods for another domestic service. People on further looking into the matter have a feeling that there is more to be learned than appears on the surface; and they "smell a rat" or something else when they are told at the beginning of a lecture that the oven has already been heated to save time. They speculate as to how much time has been consumed in the heating-up process, and how many units of electricity have to be paid for as the result, before the actual cooking commences. We have been anticipating some account of the trials of cookers for the £100 prize, but nothing on the subject, so far as we have seen, has been in print. A fortunate and patient Gas Engineer saw a preliminary test one afternoon last week, after a cookery demonstration at Olympia. Three cookers only were on trial; and two of them, he tells us, were simply gas-cooker ovens, electrically heated. The preliminary trial, so far as he could ascertain, was to satisfy the Committee who were present that it was possible to bake a loaf of bread. This implies that the Committee had their doubts. The three cookers were cold; and current was switched on to all of them simultaneously. Only one loaf of bread was cooked in each. Evidently the Committee got tired of waiting, as they left long before the first loaf had finished baking. The patient Gas Engineer stuck to his observation, and noted that one-and-a-quarter hours were occupied from the time that the current was switched on, to the finishing of the first loaf, That loaf was not made and baked at the market price of the day. How long the others took our informant cannot say. There were no meters attached to the cookers; but it was understood that an official test with separate meters would be made next day, also after the cookery demonstration. A representative of the "JOURNAL" was present at that hour; but he failed to learn anything about official tests. We hope the preliminary run did not exhaust the Committee. There has been some correspondence in the "Morning Post" as to the relative cost of heating a quart of water by electricity and gas; and, as will be seen by the reprint of the letters in our "Miscellaneous News," Mr. W. J. Atkinson Butterfield, by simple experiment such as any householder who can read a gas-meter can make, quickly dispersed electrical assumptions and claims to superiority in even this simple domestic operation. It is as we have long contended—the public ask for explicit statement on these matters such as they can understand; but electrical partisans, knowing that this requirement would not show their pet commodity up in the best light, treat the public to ambiguous enunciation. Probably they argue with themselves that they can make progress as fast one way as the other, and they chose the path of obscurity.

Monazite.

The exports of monazite sand from Brazil in the first six months of 1905 increased considerably compared with the corresponding period of 1904. The figures were 2,622,798 kilos., as against 1,836,340 kilos.; and the value was £59,544, compared with £41,220. In describing a plant recently erected for the centralization of monazitiferous gravel found in quantity along the banks of the River Parahyba, the "Brazilian Review" states that this treatment of river ground is entirely a new industry in Brazil; and if successful will "revolutionize trade in monazite." The owner of this installation, which is situated at Lage, estimates that he can produce by means of his separating process from a raw material containing only 2 per cent. of monazite a finished product at the rate of 50 tons a month, which he values at 700 frs. per ton. If these figures are correct, says the "Brazilian Review," it is probable that other installations will be erected for the treatment of the monazitiferous sands which appear to be widely distributed in river placer deposits, and thus "the monopolists of the 'marinhas' (foreshores) may lose their control of the market."

Motors for Carting Coke, &c.

The vast growth of the business of gas undertakings during late years has necessarily been accompanied by greatly increased cartage in the district. Apart from the carriage of coke and other residuals, the moving of stoves and meters has made larger demands on the transport resources of almost every gas undertaking. There are now concerns employing motors for this work; and their present and past experience is wanted. There is a motor that is well spoken of that is driven by a steam-engine; the steam being generated by gas coke. A correspondent who is considering the matter from the economical point of view, has written suggesting that we should ask readers who have employed motors for the carriage of coke, stoves, &c., to give their experience for the benefit of others, both as regards the initial cost of the motors and the expense of their upkeep. The topic is one of current interest; and we cordially accede to our correspondent's request. Any communications throwing light on the subject will be received with pleasure.

Conference on Smoke Abatement.—We learn from Mr. E. White Wallis, the Secretary and Director of the Royal Sanitary Institute, that the question of finding some practical means for abating the nuisance caused by smoke will be discussed by the members of the Institute and the Coal Smoke Abatement Society at a conference to be held in December in the Royal Horticultural Society's New Hall, under the Presidency of Sir Oliver Lodge. The sections to consider domestic smoke abatement, factory and trade smoke abatement, and administration, legislation, and necessary reforms, will be presided over by Sir George Livesey, Sir William Preece, and Sir William Richmond. In connection with the conference, the Royal Sanitary Institute are arranging an exhibition of smoke abatement appliances; the classification of exhibits including those for heating and cooking by gas or electricity. It will be the endeavour of the Institute to bring before those who attend the conference the measures now taken to lessen the smoke nuisance, and also the alternatives to the use of solid fuels in the home as well as the factory.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 254.)

For the greater part of last week there was hardly a sign of nascent improvement to be discerned in the position of things on the Stock Exchange. Now and then a little lighter ray would penetrate the gloom, but it quickly faded. The cause of the depression, of course, remained the same—the state of the Money Market. But after Thursday there were indications of relief. Another week had closed without any variation in the Bank-rate, and hope took better courage. On Friday, the realizations were not overwhelming; and the feeling was distinctly more cheerful. The money stringency was relaxing, and prices looked up. The brighter view outlasted the next day, and the close was comparatively comforting. The course of the Money Market has been so fully, if not very consentiently, treated in the daily Press, that it suffices here to record the easier closing. Business in the Gas Market suffered—like most other markets—from the prolonged strain. In point of volume it was reduced; and there was a shrinkage in values, although not to any great extent either in degree or in the array of issues affected. In common with other securities of the highest class, the debenture stocks have most felt the malign influence. Of the Gaslight and Coke issues, the ordinary was pretty active on the opening and closing days; but business fell very quiet in the interim. The prices at which transactions were marked were very firm. There was one parcel let go at 100⅛. Otherwise, the figures ranged from 100¼ to 100⅜; the latter being marked repeatedly. Very little was done in the secured issues. The preference changed hands twice at 113, top price; and the maximum marked 91. The debenture stock fell a point, and was done at 87 and 86½. South Metropolitan was not in favour, and was freely dealt in at reduced prices. From a mark of 131½ on the opening day, it shrank steadily to 128½ on Friday; but the final bargain was 129½. The quotation was lowered two points. Nothing at all was recorded in Commercials; but the quotation of the 4 per cent. was put down a point. Very little business was marked in the Suburban and Provincial group, but no weaknesses were shown here. Bournemouth "B" was done at 17¼; and Bromley "B," at 92. South Suburban ordinary changed hands at 124, ditto preference at 131, and West Ham ordinary at 106. Southampton—a stock not much in evidence—was dealt in at 112½ and 113. The Continental Companies were quiet on the whole; but there were several transactions in Union, which was inclined to fall. From an opening price of 122½ on Monday, it eased away to 119¼ on Friday; and the quotation went down a point. Imperial was done at from 220 to 221¼, a small parcel of European fully-paid at 22⅜ free, and ditto part-paid at 15¼. Tuscan realized 9⅞. Among the undertakings of the remoter world, Bombay was done at 6⅞ and 6¾, and Oriental at 147 and 148. Primitiva ordinary was easier at from 6¾ to 6 15/16, ditto preference marked 5 13/32, and ditto debenture 98¼ and 98½. River Plate was also easier at 13⅛ and 13¼. Monte Video marked from 12⅜ to 12½, and Ottoman 6¼ and 6 5/16.

The closing prices are shown in our Stock and Share List on p. 254.

ELECTRIC LIGHTING MEMORANDA.

The City Lighting—More "Estimates," or Proofs of How the City Ratepayers have been Paying Dearly for Electric Lighting—Mr. "Bailey" in Humorous Vein—Inquiring for Figures—Workhouse Lighting—Ignorance on Incandescent Gas Lighting—The Local Government Board and Municipal Speculation.

The penmen of the electrical papers have in the past week unanimously tried to calm themselves, and to view the City business in a more philosophic spirit. The little bit of touting that the "Electrician" has been indulging in, to get estimates for the electric lighting of City streets from people who have no earthly chance of engaging in business with the City Corporation, has brought fresh fruit. This sort of thing is rather unkind to the Electricity Company who have been supplying the City arc lamps for many years. Mr. S. L. Pearce, who is safely away in Manchester, puts forward figures for lighting Fleet Street with twelve arc lamps; and one of his sets of figures declares that it can be done for £174, taking electricity at 1½d. per unit. The old charge for the inefficient lighting in Fleet Street was £312; so that, according to Mr. Pearce's calculation, the ratepayers of the City have been cruelly dealt with, having had £138 a year, or £11 10s. per lamp, too much lifted from their pockets for lighting Fleet Street. Applying this to the 500 electric arcs in the City, the ratepayers have been paying out some £5750 per annum too much, and are now paying the City Lighting Company £5175 per annum over and above what the remaining lamps are worth. But that is not quite enough. We had almost overlooked the fact that Mr. Pearce's twelve lamps are to have a total effective illuminating power of 10,000 candles; so that we ought—as the "effective" candle power of the present City arc lamps is a varying quantity, but on the average (let us say), about half Mr. Pearce's figure—to be getting the lamps, judged by the standard of value for money, at about £7 5s. each per annum, instead of £26. As interested ratepayers, we may commend these figures to the City Corporation, so that they may try to save the £18 15s. per lamp on 450 lamps which the ratepayers are very wrongfully being asked to pay—that is to say, if Mr. Pearce is right. There are some other figures which have been freely scattered that are even more favourable to the ratepayers than Mr. Pearce's, which together constitute rather a formidable condemnation of the City Electric Lighting Company. These framers of estimates for arc lighting in comparison with the ordinary incandescent gas-burners in Fleet Street, would hardly themselves appreciate the treatment they are meting out to the City Electric Lighting Company. If, however, the Company were entirely composed of such funny men as Mr. Bailey, who is the Chief Engineer, we should say that this newspaper management of the Company's business affairs served them right, and is necessary. The other night Mr. Bailey delivered on address at Olympia on electric arc lighting, in which there was a little mediocre humour, which no doubt went down well with his electrical audience. He referred to high-pressure gas as "pushed" gas "because it was pushed for all it was worth;" and he alluded to burglars getting in first-floor windows where gas was employed in the streets. We have not heard that in the many miles of City streets lighted by incandescent gas-lamps, the nefarious work of the burglar has been more rife than in the few miles of streets lighted by electric arc lamps. If it is to be a function of the street lamp to protect first-floor windows to prevent burglaries, then why not carry the lamps up to the roofs? Mr. Bailey's Company have shown that this protection of upper storeys can be too expensively purchased. Not a comparative figure of any kind from the cautious Mr. Bailey! He, however, exercised himself a little bit over the consumption of mantles in street lighting; and one or two of the electrical papers have been doing the same—believing that the Gas Company are so uncommercial as to be doing this lighting without profit, just for the sake of the advertisement. Presently we will show that they are not so foolish. In ordinary street lighting the consumption of mantles per annum may, according to position, vary anywhere between (say) four or five and a dozen per annum; and for Mr. Bailey to suggest that the Company are changing "the mantles even day by day" is not an honourable way of putting it. Only those that require replacing are attended to on any one day, which is a totally different thing from what Mr. Bailey was inferring.

However, we have but to fall back again on Mr. Pearce, who wrecks his own calculations as to what Fleet Street could be lighted for, by disagreeing with those who are advocating arc lamps of high candle power for street lighting. He says—

> I think the gas people are on the right lines in using lamps of smaller candle power, and more of them. We have endeavoured to adopt this principle in Gorton by using the smallest arc lamp possible consistent with good working results. In making a comparison between flame arcs and the present Fleet Street gas, better figures for the former could, no doubt, be shown by using fewer lamps of greater individual candle power; but this course I believe to be on wrong lines for securing good diffusion of light.

This is about the first time that we have been able to agree with Mr. Pearce on a matter affecting the public lighting. A better diffusion and not concentration of light is one of the strong points in favour of incandescent gas lighting. Mr. Pearce gives some figures as to the lighting of the Hyde Road, Gorton, by 22 Gilbert single-enclosure arc lamps of a "maximum" illuminating power of 430 candles, at a cost per annum of £8 each for 4000 lighting hours. Mr. Pearce does not tell us the items composing the cost, as he does in the case of the estimates for the Fleet Street lighting by large arcs, which he condemns. We do not know, among other things, how much he is charging per unit for the lighting. In Manchester the charge, according to the last accounts, was 2d. per unit for public lighting; but he gives 1½d. for Fleet Street. Why he takes such care in not giving us items in his possession, such as he presents in his estimates for Fleet Street, is incomprehensible; but he has no doubt good reason. We have, however, some little misgivings in reference to Mr. Pearce's Gorton figures, and may be pardoned for thinking that this is what the electricians are dubbing the City lighting—a piece of "show" work, as it is well-known Mr. Pearce is a disappointed man over the patronage of his department for public lighting. The cost of the 22 arc lamps at £8 is £176; but, as we say, there is nothing to indicate whether this covers the whole of the expense incurred, or is profitable. These "small" electric arcs, however, displaced 25 lamps "mostly" containing two Welsbach burners, costing £150, or £26 less than electricity. As the cost for gas only came to £3 per lamp per annum, the remaining £3 for mantles, maintenance, &c., shows a pretty good margin, seeing that (with the exception of the extra for mantles) maintenance and labour for a double-burnered lamp ought to work out to but little more than for a single-burnered one.

Reverting to the point as to whether £176 is a fair charge for the 22 arc lamps, on the page of the "Electrician" containing Mr. Pearce's figures, are some from the Gilbert Arc Lamp Company for lighting Fleet Street. Presumably the lamps this Company recommend are the same that Mr. Pearce has been referring to; for remark what they propose: ". . . twelve enclosed lamps of our standard single-enclosure type, *such as are used in Manchester* for street lighting. According to the rate which Mr. Pearce says should be charged there—1¼d. per unit—the cost of twelve such lamps would be £151 10s. Now this

works out to £12 12s. 6d. per lamp; and therefore—assuming the type of lamps are the same—according to the Gilbert Arc Lamp Company the cost for lighting Hyde Road, Gorton, with 22 lamps should be at least £277 15s., as against the £176 mentioned by Mr. Pearce. And do not overlook the fact that the Gilbert Company are only calculating on 1¼d. per unit. The lighting hours at Gorton are 4000, against 4300 for Fleet Street; but this does not account for the difference of £101 15s. It is a strange thing that with all this figured cheapness for public electric lighting that has come upon the country with startling suddenness, the sum of every district's lighting accounts where electricity is used should be greater than before. The electricians must admit there is something inscrutable about it all. Bearing upon the lighting of Fleet Street, the "Electrician" last week informed its readers that high-pressure gas was being used in Fleet Street. To their leader writer, "it now appears"—though it has so appeared to almost everybody else since Sept. 30—that low-pressure gas is being used in Fleet Street. This week, the leader writer states that the "C" burners in Fleet Street each consume "2 cubic feet of gas per hour, and give 75-candle power when the mantles are new." These little hints show how erudite is our friend on the subject; but the acknowledgments of the gas industry are due to him for the splendid efficiency that he gives to normal pressure gas per cubic foot used with incandescent gas mantles. This is not a bad sort of world. We do get some fun out of it, even when electrical estimates and so forth are engaging attention.

Then "Meteor" of the "Electrical Times" is wanting to know something. His mind is seriously disturbed by a suspicion that the Gas Company's quotations were not put forward on a normal basis, which is a thing that electricians' quotations frequently suffer from, judging by an examination of the prices charged for public lighting and private lighting and the total works' and management costs. We do not know how the Gas Company's charges are made up; but one can get at some idea. The Fleet Street lighting has had the greatest weight thrown against it. In February, 1904, before this fresh scheme of lighting was thought of, we published a communication from Mr. D. J. Ross, the then City Engineer, in which it was stated that £3 1s. 1d. per single-burner incandescent gas-lamp was the average cost in the City, excluding mantles at 4d. each. Therefore, for the double-burnered lamps (in which the charges other than for gas and mantles are not considerably more than for single-burnered lamps), the £6 2s. does not look like a "cut" figure. But apply another test. Mr. Ross in the same communication [February last year] said the price of gas should be taken at 2s. 3d. per 1000 cubic feet for public lighting, and the hours at 4300 per annum. The price may be lower now, but certainly not higher. These burners are of the type that consume (say) 3½ cubic feet of gas per hour. 4300 × 3½ = (approximately) 15,000 cubic feet, which at 2s. 3d. = £1 13s. 9d. per burner, or £3 7s. 6d. per double-burnered lamp. Even assuming that an average of twelve mantles per burner is required at the substantial price for large purchases of 4d. per mantle, this would amount to 4s. per burner, or 8s. per lamp. So that we have £2 6s. 6d. per lamp left for labour, &c., or £79 for the 34 lamps in the one street. There is nothing suspicious about this. Perhaps the Gas Company will supplement these calculations by the exact figures; but, meantime, "Meteor" need not worry himself over the Gas Company having dealt with this matter in any other than an ordinary business way.

There was a rabid article in the "Electrical Review" the other week, headed "The Triumph of Ignorance." In the eyes of our friends of the electrical press, ignorance appears to exist everywhere excepting in their own editorial offices. The triumph which produced the diatribe on this occasion was that of gas—not of ignorance—in competition with electricity at 2½d. per unit for lighting the new workhouse at Stourbridge. The triumph was accentuated by the fact that 25 votes were cast in its favour against 11 for electricity. The ignorance which the superb wisdom of our electrical contemporary charges against the 25 Guardians has relation to the illuminating power of incandescent gas mantles. Unbelief in this regard is one of the characteristics of writers on electrical subjects; and they would lose their petty, unsubstantiated argument if they put their unbelief to practical test, and honestly abided by the result. We were told by one writer the other day, in the coolest manner possible, that he was not disposed to accept our figures as to the illuminating power of incandescent gas-lights; and now the writer in the "Review" is also disinclined to give credence to the assertion made, at the meeting of the Stourbridge Guardians, that the illuminating power to be obtained from ordinary incandescent mantles is equal to 16 candles per cubic foot of gas. Why, Mr. James Swinburne, as shown last week, has actually more knowledge of the subject than the "Review" writer; for he gives a very fair average illuminating power to incandescent mantles, used with ordinary burners, when he puts it at 18 candles per cubic foot. Perhaps it will be retorted that ignorance has also triumphed over Mr. Swinburne; but we should not believe it. Before the Stourbridge Guardians, mention was correctly made of ordinary incandescent burners giving 40 to 60 candle power; and, in consequence, we get, in the "Review," a delectable comment on it, running thus: "As we say, it was not suggested by any speaker that this high candle power, if ever attained, is a thing of a moment only—a fleeting brilliancy which gives place before a dozen hours are past to a semi-incandesced surface, throwing out sickly green rays and poisoned fumes into the living-rooms." Readers are entreated not to laugh too heartily over this veritable triumph of ignorance; but to temper their tickled feelings with an amount of commiseration. However, instead of persisting in such mendacious statements, it would be rather more honourable if these writers would put the incandescent mantle to the test. If they have not the necessary convenience, we will gladly find them a fair opportunity of doing so, on the one condition that their observations are faithfully reported to their readers.

The question of workhouse lighting has not only been engaging attention at Stourbridge, but at Ashton-under-Lyne; and the Stourbridge Guardians will find their views on the subject are very much in agreement with those of the Local Government Board. For the electric lighting of the workhouse at Ashton, an application for a loan of the modest amount of £5000 was recently made to the Local Government Board. The Board promptly inquired whether the Guardians had considered the question of obtaining a public supply of energy before deciding to instal works of their own. More pertinent still was a further inquiry as to what—seeing that the buildings are already lighted or fitted for lighting by gas—special reasons there are for illuminating the new infirmary and part of the workhouse by electricity. We have not yet seen the answer of the Guardians; but it should be an interesting one when it does appear. There are many things connected with the methods and doings of the Local Government Board that are open to criticism; but their single-handed efforts at repressing local extravagance must have the sympathy of the general body of ratepayers. Occasional public successes do fall to the electricians to cheer them. For the lighting of the Hilda Road schools, the West Ham Educational Committee have resolved to put in the electric light; the price to be paid being 4d. per unit. That is how the announcement is made in an electrical contemporary. But a correspondent in a paper devoted to municipal matters is rather more candid, and states that it has been decided to light the school with electricity at a cost of about £500, against £200 for incandescent gas-light. The cost of the vanity of the Educational Committee will therefore go to swell what is popularly known as "West Ham's Educational Burden." Probably the ground for the anxiety of the Educational Committee to extend their patronage to the electricity undertaking is to be found in a further assertion that "shopkeepers who have tried the electric light are having it cleared out as fast as they possibly can; the only people to say a good word for it are councillors and officials." If this is true, the ratepayers will be made to suffer, unless they put an end to the struggles of their representatives to force support from the ratepayers through the public institutions and street lighting.

The reference in the preceding paragraph to the close watch the Local Government Board are keeping upon expenditure that is both unnecessary and covered with uncertainty, is again instanced by the intimation they have made to the Louth Town Council that their application for a loan of £17,000 for the establishment of electricity works "has been refused, on the ground that the evidence adduced at the inquiry failed to show how the scheme could be worked with financial success." It is not, however, always that the sagacity of the department "spots" the doubtfuls. The Dudley Corporation Electricity Department, according to the accounts, last year made a surplus profit of a few hundreds on a tremendous capital expenditure. Whether or not these few hundreds constituted sound "profit," we cannot say, as the detailed accounts are not before us; but we have a little suspicion on the point, inasmuch as Mr. H. Ross Hooper, one of the Inspectors of the Local Government Board, found it necessary the other day to animadvert rather severely upon the financial methods of the Electricity Department. Of an application for £21,000, no less than £6000 was to cover excess expenditure on previous loans, dating back as far as 1899. A debt incurred in that year had not been paid off at March last; and there had been an overdraft at the bank. Yet the accounts had been certified as correct. Mr. Hooper was altogether very sceptical about the accounts; and he is going to investigate them *seriatim*. His indignation should have a salutary effect upon the Council, as well as awaken the ratepayers to the miserable manner in which their electricity finances have been jumbled up and mismanaged. If the Inspector's indignation works no good, perhaps the fulfilment would of his threat not to recommend that sanction be given for the negotiation of the loan if he is not satisfied as to every detail—and not so only in Dudley but elsewere. Among other places that can boast of having exceeded their borrowing powers by a not insignificant sum is Aston; and it gives another gloomy illustration of the amount of reliance that can be placed on electricians' estimates. The Corporation have asked the Local Government Board for permission to borrow £50,000; and it turns out that £20,000 of this is for an excess upon a loan of £52,436 sanctioned in 1902. The Local Government Board will have to get Parliament to invest them with more effective power for stopping this flagrant abuse of their authority. Trading governing bodies have evidently not the greatest respect for the Whitehall department.

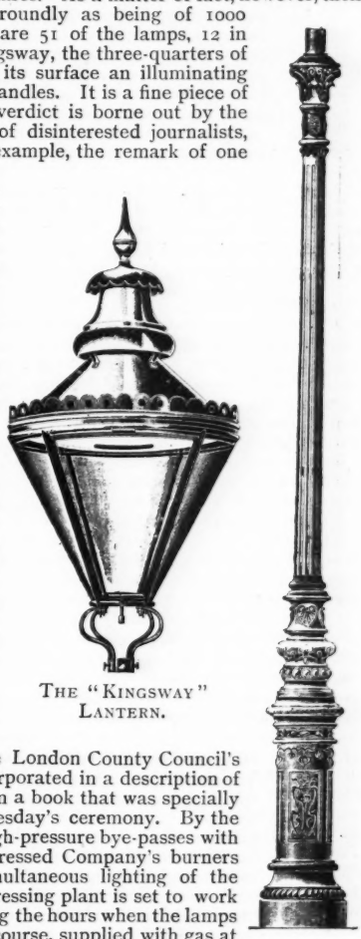
The Junior Institution of Engineers (Incorporated) has been registered with an unlimited number of members, each liable for £1 in the event of winding up, to take over the unincorporated Association, established in 1884, known since 1903 as the Junior Institution of Engineers. The word "Limited" is omitted from the title by licence of the Board of Trade.

THE LIGHTING AND SUBWAYS OF ALDWYCH AND KINGSWAY.

THE opening on Wednesday by the King—in the presence of the chief of our Metropolitan magnates, the civic rulers of Paris, and a concourse of people greater than the authorities had anticipated—of the new thoroughfares of Aldwych and Kingsway was befitting the majesty of the great improvement scheme which the existence of these main avenues will be the memorial. The County Council may well, as Mr. E. A. Cornwall, the Chairman, said in his address to the King and Queen, take pride in the fact that, while this improvement has caused the demolition of much undesirable property, the two thoroughfares will eventually form one of the most beautiful features of the capital. The improvement, in fact, is the largest and most important that has been carried out in London since the construction of Regent Street in 1820. It gives a connection between north and south London at that part of the west central district which needed it most; and further it solves the problem of connecting north and south London by means of the tramway system. This is effected by a subway, in conjunction with which are provided tunnels for pipes. The complete thoroughfare (including side streets) is about 4200 feet in length, or just over ¾ mile. The length of Kingsway is 1800 feet, and of Aldwych 1500 feet. The roadway is broad, being 60 feet, with footways on both sides each 20 feet wide. The new street starts from the junction of Theobald's Road with Southampton Row, and proceeds southwards along the line of what was formerly the narrow thoroughfare named Southampton Row. Then crossing Holborn, it proceeds through what was formerly Little Queen Street, and then in a straight line to the site of the old Olympic Theatre, which fronted Wych Street. At this point, the street divides and forms a crescent, the eastern horn of which debouches into the Strand at St. Clement Danes Church, while the western horn enters the Strand at Wellington Street, almost opposite Waterloo Bridge. From Holborn to the junction with the new crescent road, the thoroughfare has been named Kingsway, and the crescent, Aldwych; both names referring to the historical associations of the district.

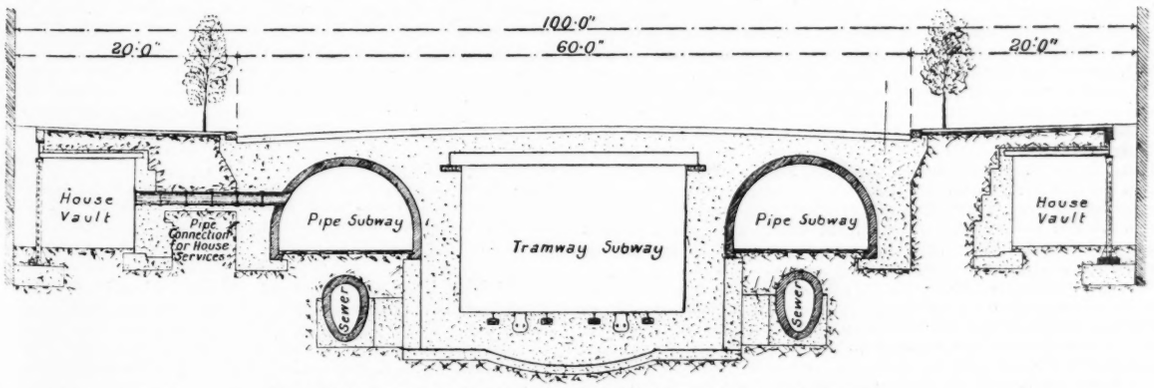
The opening of this grand new thoroughfare is invested with special interest for the gas industry, owing to the circumstance that a more conclusive piece of evidence of the trend of municipal opinion in London (as well as in the City) on the question of public lighting could not be had than is afforded by the fact that the authorities concerned in the future administration of these grand thoroughfares—the Westminster City Council and the Holborn District Council—after having considered tenders for the lighting from the Charing Cross and Strand Electric Lighting Company, the Metropolitan Electric Supply Company, and the Gaslight and Coke Company, and having thoroughly investigated what these Companies had to offer, decided that gas lighting by high-pressure incandescent lamps supplied superior advantages. The electricians may sneer at the claims of gas to "victories;" but this is a victory the importance of which they cannot well deny. There was no question here of so-called "worn-out" arcs and unfairness, but open competition; and gas won. The Governor of the Gaslight and Coke Company (Sir William Makins), at the time the contract was secured, expressed the gratification of the Board at a meeting of the proprietors; and it is an equal gratification to us to be able to acknowledge, now that the new streets have been opened, that the Company have fully justified the confidence shown in them by the authorities. It may also be inferred that the London County Council were in agreement with the Local Authorities named, seeing that they bore the portion of the cost of installation that would have been incurred had ordinary instead of special lamp-columns been fixed.

It is of interest to recall the fact that the Gaslight and Coke Company's tender for the lights, which are on the "Millennium" system of the British Compressed Gas Company, Limited, was £20 per lamp for installation, and £15 10s. 5d. for maintenance and the supply of light. The latter figure has since been reduced by 9s. 6d., in view of an arrangement that penny changes in the price of gas shall carry an alteration of 9s. 6d. in the covenanted price. The two Electric Light Companies each quoted £45 per lamp for the installation of arc lamps, and £27 for maintenance and lighting. These prices are significant, in view of recent boastings as to what certain Electricity Companies would do were they only given the chance. The illuminating power of the new high-pressure gas-lamps has been widely quoted as 700 candles each, through that figure appearing as the minimum in the contract, and through it being given officially on the day of the opening of the new thoroughfares. As a matter of fact, however, their power may be taken roundly as being of 1000 candles; and as there are 51 of the lamps, 12 in Aldwych and 39 in Kingsway, the three-quarters of a mile has spread along its surface an illuminating power of quite 50,000 candles. It is a fine piece of illumination; and this verdict is borne out by the independent testimony of disinterested journalists, as witness, by way of example, the remark of one paper devoted to municipal affairs: "A visit to the street at night shows the lighting to be brilliant, well distributed and diffused, and worthy of the thoroughfare. It is, in short, decisive evidence of the capacity of modern gas-lamps to light efficiently and economically the finest streets in the first City of the world."



THE "KINGSWAY" LANTERN.

It has been mentioned that the "Millennium" high-pressure system was the one adopted for this lighting. The compressing plant has been installed in a vault adjoining Aldwych; and the mains conveying the high-pressure gas are carried through the pipe subways shown in the sectional drawing of the underground works, which Mr. Maurice Fitzmaurice, C.M.G. the London County Council's Chief Engineer, has incorporated in a description of the subways published in a book that was specially prepared for last Wednesday's ceremony. By the use of the automatic high-pressure bye-passes with which the British Compressed Company's burners are fitted, there is simultaneous lighting of the lamps directly the compressing plant is set to work—the bye-pass jets during the hours when the lamps are not in use being, of course, supplied with gas at ordinary pressure. The lanterns are 33 inches in diameter. We give an illustration of those in Kingsway, which were made for the Holborn Council by Messrs. S. Pontifex and Co., who also supplied the highly ornamental columns which appear in that part of the area lighted. These columns are 18 feet high from the ground level. Messrs. Pontifex and Co. have put up here very tangible evidence of their capability to turn out really excellent work. There are certain variations in the lamps and columns (the latter made by the British Mannesmann Tube Company, who have also earned for themselves a high reputation for this class of work) in the portion of the thoroughfares within the area of the City of Westminster, but not of such degree that they will be noticeable. The idea of putting the lamps on columns of more



THE TRAMWAY AND PIPE SUBWAYS IN KINGSWAY AND ALDWYCH.

than the usual height is due to Mr. J. W. Bradley, the City Engineer of Westminster, who, contrary to many other authorities, believes that the higher standards assist in the diffusion of the light.

Regarding the subways in the new thoroughfares, the illustration will give some of the points of engineering interest. It may, however, just be stated that the greater portion of the tramway subway is close to the surface of the street. In fact, from a little to the north of Great Queen Street to the junction of Kingsway and Aldwych, the depth from the surface of the street to the top of the subway is only about 3 feet. But the levels vary; and some considerable dips have had to be made. The subways for pipes and wires have, it will be noticed, been constructed under each side of the carriage way of the new streets; the width being 12 feet and the height 7 ft. 6 in. There can be no discussion as to the policy of constructing subways in new streets of such importance, inasmuch as they avert all necessity for breaking up the roadway for the laying of pipes; in fact, the small depth from the surface of the road to the top of the subways will not permit of any pipes being laid.

GAS ACTS FOR 1905.

In dealing, in this third article, with the Acts of Local Authorities in which there are gas clauses, it is necessary that a misstatement in a recent article on the past session's work should be corrected. It was mentioned that the Bill promoted by the Hessle District Council for acquiring the gas undertaking had received the Royal Assent. It was not so; the Bill from Hessle that passed was that of the Gas Company. As a matter of fact, neither of the two Bills—Hessle or Otley—which had for their object the expropriation of the property of the Gas Companies got very far through local opposition.

In the Act of the Accrington District Gas and Water Board, the limits of both the gas and water supply are extended to include the whole of the township and parish of Altham. Leaving to future notice the water clauses of the Act, it is observed that the proposal that the Board should be at liberty to allow rebates upon such scale as they may think fit, with restriction to 20 per cent. for illuminating purposes, has been altered to the 10 and 15 per cent. for prompt payment and large consumptions in accordance with the general practice during the session. Section 30 of the Lancashire and Yorkshire Railway Act is amended, so as to authorize the Board to use petrol, steam, electrical, gas, or other mechanical power for moving carriages or waggons along the line of rails leading from the North Lancashire loop line at Great Harwood across Hey's Lane into the Board's gas-works. For the purposes of the undertaking, in addition to the existing loan of £60,042, any sum sanctioned by the Local Government Board may be borrowed, and sixty years is the period allowed for repayment. A debt of £22,938 18s. 3d. (made up of deficiencies) by the water undertaking to the gas undertaking is cancelled; and the section of the Act of 1894 referring to the matter is amended. Power is given to create a fire insurance fund which, when it reaches £20,000, may be discontinued at the discretion of the Board; and an accident fund up to £10,000 is allowed for meeting claims under the Employers' Liability and Workmen's Compensation Acts. [*Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents.*]

By the Bangor (County Down) Water and Improvement Act, the extension of the gas-works is provided for. The limits of supply are also enlarged by the inclusion of so much of the rural district of Newtownards as lies within three miles of the boundary of the district; but the powers are not to be exercised in any part of the rural district of Newtownards without previous consent of the Rural District Council. There are several other provisions of an ordinary character. For the undertaking, authorization is given to the borrowing of £7000; and the Local Government Board have power conferred upon them to approve of further loans. Repayment of the £7000 is to be within thirty years. [*Messrs. Martin and Leslie, Parliamentary Agents.*]

The Colne Corporation Act includes a number of modern clauses referring to gas supply. Among them, the Corporation are invested with the right of charging 10d. extra per 1000 cubic feet for the hire of a prepayment meter and fittings, and 10 per cent. per annum on the cost of a meter without fittings. Discounts of 10 and 15 per cent. respectively for prompt payment and large consumption are permitted. Money may be borrowed for gas-works purposes with the approval of the Local Government Board, to be repaid within such period not exceeding sixty years as the Board think fit. [*Messrs. Baker and Co., Parliamentary Agents.*]

In the Halifax Corporation Act, two clauses constitute the part referring to gas. One of them alludes to the period of error in defective meters, the other to anti-fluctuators and silencers for gas-engines—both being of common form. [*Messrs. Lewin, Gregory, and Anderson, Parliamentary Agents.*]

Again, in the Loughborough Act, the only point for notice here is that the Corporation have been empowered, as are most statutory gas concerns nowadays, to refuse to supply electrical energy and gas in cases where consumers are in arrear. [*Messrs. Rees and Freres, Parliamentary Agents.*]

By the Matlock Bath Improvement Act, the time for the removal of the gas-works (as limited in the Act of 1896) is extended for a period of seven years, and in the event of the Council not removing them, they are to pay to the Matlock Urban District Council a daily penalty not exceeding £5 until such removal. Land to which to remove the works is scheduled for acquisition. Authorization is granted to the Council and the London and North-Western and Midland Railway Companies to enter into contracts and agreements for the provision of railway sidings to the gas-works and for the making of a platform or landing-place on the canal at Cromford. The illuminating power of the gas is reduced from 18 to 15 candles. For the purchase of lands and the erection of the works, the borrowing of £10,000 is allowed, repayment to be within forty years. [*Messrs. Baker and Co., Parliamentary Agents.*]

By their new Act, the Nottingham Corporation have power to make provision out of the revenue of the gas undertaking, or out of the general district rates, for the extinction of the gas annuities granted under the Nottingham Corporation (Gas) Act, 1874, by means of a sinking fund appropriated and invested in statutory securities, and with the accumulations, from time to time applied to the purpose, to extinguish the annuities within 60 years (not 75 years as proposed by the Bill) from the passing of the Act. There are supplementary sections referring to this matter. Other clauses are of the ordinary type. [*Messrs. Sharpe, Parker, Pritchards, Barham, and Co., Parliamentary Agents.*]

The Act of the Rhondda District Council confers authority to purchase an additional 2184 square yards of land adjoining their Ystradyfodwg gas-works for extension purposes. Among other provisions, power is accorded to the borrowing of £20,000, and further sums with the consent of the Local Government Board. The term of repayment for the £20,000 is not to exceed thirty years, instead of the forty asked for in the Bill; but for other amounts the Local Government Board may allow periods not exceeding sixty years. Section 67 of the Act of 1896 (as to deficiency in receipts) is repealed; and any deficiencies in gas revenue and receipts are, in the absence of a reserve fund or in the event of an insufficient reserve fund, to be made good out of the district fund, but the amount is to be a debt due from the gas revenue account to the district fund. [*Messrs. Torr and Co., Parliamentary Agents.*]

By their Act, the borrowing powers of the Tralee District Council in respect of their gas undertaking are enlarged by £4000. which is to be repaid within periods (not exceeding sixty years) to be fixed by the Local Government Board, when sanctioning the loans. [*Messrs. Holmes and Greig, Parliamentary Agents.*]

Certain gas undertakings were interested in offering opposition to the Thames Conservancy Bill—now an Act. In this, the Conservators are authorized to deepen and widen the bed and channel of the river between the Nore and Gravesend; and their resources being inadequate to meet the requisite expenditure, they are empowered, for a period of three years, to demand and receive 1d. instead of ½d. per ton in respect of every such vessel as is mentioned in paragraph 1 of section 155 of their Act of 1894, and 1½d. instead of ¾d. per ton in respect of every such vessel as is mentioned in paragraph 2 of the same section. [*Messrs. Wyatt and Co., Parliamentary Agents.*]

"Gas and Oil Power."

We have received the first number of a new illustrated monthly review, bearing the above title, which has been started in the interests of factory-owners and other users of power. The policy of the paper, as stated on the opening page, is to demonstrate the enormous advantages obtainable by generating power in the cheapest way compatible with efficiency; and this it is proposed to do by describing and illustrating new power plants already installed, and analyzing the cost at which they perform their functions. The conductors of the new publication have been fortunate in securing the services, as Continental Correspondent, of M. Mathot, from whose paper on "The Growth of Large Gas-Engines on the Continent," read at the Liége meeting of the Institution of Mechanical Engineers, extracts were given in the "JOURNAL" last July. He commences an article on "Systems of Governing, Cycles, and the Construction of Internal Combustion Engines." Mr. W. E. Buck contributes an article on "The Transmission of Power in Works and Factories;" and a start is made with Mr. Dugald Clerk's Cantor Lectures at the Society of Arts on "Internal Combustion Engines," which are being reproduced, with the illustrations, by special permission. The other contents consist mainly of shorter articles, news paragraphs, and market reports. An exceedingly useful feature, however, is a table, extending over five quarto pages, showing the cost of power and light, furnished by coal gas, suction gas, and electricity, in the Metropolis and various towns. Altogether, a good beginning has been made with what we believe is really, as the Editor states, the first publication of its kind; and it will now be for him to ensure for it, by the character of its contents, recognition and support by those in whose interests it has been projected

Halifax has lost an earnest public worker by the death of Alderman G. H. Wadsworth. Deceased (who was 59 years of age) entered the Town Council in 1898, and only last November was elected an Alderman. He took over the chairmanship of the Gas Committee in 1901, and worked hard and conscientiously in the interests of this important undertaking. He leaves a widow and two sons.

ANALYSIS OF AMMONIACAL LIQUORS.

THE difficulties that have hitherto existed in accurately determining the components of ammoniacal liquors from gas-works may be grouped under two heads: (*a*) The distribution of sulphur; and (*b*), the distribution of cyanogen. The difficulties are sufficiently serious when either of these groups is present; but when both co-exist in the presence of organic matter, as they do in gas liquor, then the quantitative determination of each compound becomes embarrassing. Messrs. B. Giles and A. Shearer by improving the methods of estimating sulphites ("Journal of the Society of Chemical Industry," Vol. III., p. 197), Messrs. F. W. Richardson and H. E. Akroyd, by their method of estimating in the presence of each other of sulphides, sulphites, theosulphates, and sulphates ("Journal of the Society of Chemical Industry," Vol. XV., p. 171), and Schwarz, by his method of estimating sulphides by means of an ammoniacal solution of zinc chloride, prepared the way for the determination of the sulphur distribution. The remaining uncertainties—mainly associated with the thiosulphate and thiocyanate—have been investigated by the Chief Inspector under the Alkali Acts, with the aid of Mr. Linder; and the results were set forth in the annual reports for 1903 and 1904. In the former, Mr. Forbes Carpenter described the modified form of the Richardson and Akroyd test that he had found most suitable for the complexities of gas liquor; and in the one for 1904, he details his tests made to ascertain the degree of reliability for this purpose that may be attached to methods devised by Herr Walther Feld, for the estimation of the same sulphur compounds when present in crude cyanogen products.

Feld's researches into this subject first appeared in 1898, and the matured methods were described and the apparatus employed illustrated in the "JOURNAL."* They include the separate estimation of sulphur in the form of sulphide as well as thiosulphate and thiocyanate; but into the first-named claim Messrs. Carpenter and Linder have not examined, nor into the case of the sulphite. From one point of view, gas liquor may be regarded as "Wackenroder's" solution, formed by the interaction of sulphurous acid, sulphuretted hydrogen, and water, producing thiosulphate, sulphides, sulphate, thionates, and solid or colloidal sulphur in the finely-divided state. A study of the behaviour of these substances, for instance, as set forth by Dr. H. Debus, in the "Chemical Society's Journal," Vol. LIII., pp.278-357, justifies this Chemist's opinion that they constitute an example of the greatest complexity to be found within inorganic chemistry. Accordingly, Mr. Linder states that the conclusions given in his memorandum are strictly limited to the experimental conditions recorded in the tables. Before further study of this document, it will be helpful to refer to the oxidation of thiosulphate by means of iodine into tetrathionate. According to Debus, the following equation is the one which most correctly represents the action where K stands for potassium, but may receive substitution by ammonium (NH_4).

$$\left.\begin{matrix} KS\cdot SO_2\cdot OK \\ KO\cdot SO_2\cdot SK \end{matrix}\right\} + I_2 = \left.\begin{matrix} KS\cdot SO_2O \\ KO\cdot SO_2S \end{matrix}\right\} + 2KI$$

Thiosulphate + iodine = tetrathionate + iodide

or $2\,(K_2S_2O_3) + I_2 = K_2S_4O_6 + 2KI$

* See "JOURNAL," Vol. LXXXVII., p. 604.

ABSTRACT FROM MR. LINDER'S MEMORANDUM.

In the present work, the procedure indicated by Feld* was varied somewhat, to determine how far the prescribed conditions are essential to success. Table I. contains the results of the analysis of solutions from which organic matter was completely excluded; the solution containing only sodium thiosulphate, ammonium sulphocyanide (thiocyanate), or mixtures of these bodies. Table II. gives analyses of a gas liquor of special composition—both by the methods described in the report for 1903, and by Feld's method, for comparison. The agreement between the two sets of figures is considered satisfactory in view of the complex character of the liquor examined, and of the special difficulty of obtaining a satisfactory separation of the cuprous sulphocyanide, in the first-named methods (see p. 33 of the 1903 report), the precipitate proving extremely difficult to filter and wash.

As regards the apparatus employed, it was found convenient in the present work to depart from the arrangement figured in Feld's paper, in order that the liquid might be admitted to the distillation flask without interruption of the gaseous current, and to allow of the use of Mitscherlich bulbs in place of the somewhat delicate and expensive train of potash bulbs. The final form of flask and condenser adopted closely corresponded to that in use for the estimation of fixed ammonia, and was interchangeable with it. The receiver was a Woulff's bottle provided with a small stoppered funnel for N/10 iodine solution on one of the three necks, to enable the completion of the reaction to be determined with certainty. At the conclusion of each distillation, the contents of the various absorbing vessels—standard iodine and sodium thiosulphate—were mixed, to avoid multiplying burette readings. The efficiency of the arrangement was carefully tested by blank experiment. The conclusions reached are generally favourable to the accuracy of Feld's methods; but from the experiences, certain precautions appear necessary if accuracy is to be approached with certainty.

Precautions.—No. 1.—Thiosulphate must in every case be exactly oxidized to tetrathionate by N/10 oidine if losses due to separation of sulphur and liberation of SO_2 are to be avoided in the subsequent distillation with hydrochloric acid. [Compare Tests A and B, Table No. 1.]

No. 2.—When sulphocyanide (thiocyanate) is absent, the aluminium foil should be rendered more sensitive to acid by previous immersion for a few minutes in platinic chloride solution, and the foil and tetrathionate solution brought very slowly to the boil after addition of the acid. When sulphocyanide is present, these precautions appear to be unnecessary. [See Test B, Table No. 1.]

No. 3.—Excess of mercuric chloride appears to retard the subsequent reduction of the sulphocyanide by the aluminium foil and hydrochloric acid. Feld's proportion—25 c.c. N/10 mercuric chloride solution for 10 c.c. N/10 thiosulphate—should not be much exceeded. (See Tests F, Table I.)

The application of Feld's methods as to sulphur distribution, with the precautions found to be necessary when employed for gas liquor, was made upon a sample which had been kept exposed to the air for some considerable time. The results are set forth in Table II., and are there contrasted with the modified

* *Ibid*, Vol. LXXXVII., p. 604.

TABLE I. (*Abbreviated*).—*Estimation of Thiosulphate and Sulphocyanide by Feld's Methods.*

	METHOD.	Elapsed Before Contents Boiled.	Time.	Total Acid 4 N.HCl.	Volume of Solution, Acid Excluded.	Sulphur.		
						Found.	Less than Taken.	
		Minutes.	Minutes.	c.c.	c.c.	Grammes.	Grammes.	Per Cent.
	Blank used for correcting results below	..	25	20	80	0·0003	..	..
A	Thiosulphate as such: 20 c.c. of 4 normal HCl with addition of more acid later	..	18	30	120	0·0300	0·0039	11
B	Thiosulphate oxidized to tetrathionate by iodine	13	38	20	90	0·0329	0·0011	3
	20 c.c. of 4N.HCl run into the cold tetrathionate, the mixture, then slowly raised to the boil with or without addition of more acid. CO_2 bubbled through the liquid in flask	25	45	20	150	0 0293	0·0047	14
	Ditto, but aluminium immersed for 5 minutes in acid platinic chloride, then washed previous to use. CO_2 enters at surface of liquid	13	25	30	60	0·0340	0·0004	1
	Ditto, ditto, but pure platinized zinc used in place of aluminium .	17	30	30	60	0·0291	0·0046	14
C	Sulphocyanide: 20 c.c. of 4N.HCl run into the gently boiling sulphocyanide; boiling continued throughout with addition of more acid	48	50	130		0·3076	0·0042	1
D	Thiosulphate (as such) and sulphocyanide: ·0157 grammes of S. as sulphocyanide. ·0169 grammes of S. as thiosulphate. 20 c.c. of 4N.HCl. run into the boiling mixture, boiling continued throughout with addition of more acid	30	27	120		0·0274	0·0052	16
E	Thiosulphate (oxidized to tetrathionate) and sulphocyanide. Mixture as D. .	35	37	80		0·0320	0·0006	2
F	Thiosulphate (removed by mercuric chloride) and sulphocyanide ·0676 grammes of S. as thiosulphate removed by boiling for 12 minutes with 25 c.c. N/10 "mercuric chloride solution".	38	37	90		0·0613	0·0016	2
	Ditto, ditto, ditto, but 110 c.c. of N/10 mercuric chloride solution.	33	40	100		0 0486	0·0143	23
	,, ,, ,, ,, 225 c.c. ,, ,, ,, ,, ...	40	40	120		0·1023	0·0550	35

NOTES.—In Test F. The sulphur as thiosulphate is the same in all three experiments. The first and second have equal quantities of sulphur as sulphocyanide—viz., ·0629 gramme; but the third has two-and-a-half times that quantity—viz., 0·1573 gramme. This was accompanied by mercuric chloride magnesium mixture, of 1, 4, and 9 relative volumes. The effect of these latter is shown by the loss of 23 and 35 per cent. shown in the last column, when the sulphocyanide was estimated by distillation with HCl in contact with aluminium foil.

Richardson and Akroyd method, as described in full in previous years' reports.

TABLE II. (*Abridged*).—*Distribution of Sulphur. Grammes per 100 c.c. in Ammoniacal Liquor from Gas-Works.*

Form of Sulphur in Combination.	After Standing 19 Months in half Filled Tin.	After Standing a Further 18 Months in Bottle, Air Excluded During the Second Period.	
	Tested by Methods described in Annual Report for 1903.		Tested by Feld's Method.
	a	*b*	*c*
Total sulphur	0·3260	0·3265	0·3260
S. as sulphocyanide directly determined	0·1165	0·1090	0·1020
,, sulphate directly determined	0·0225	0 0270	0·0270
,, sulphite	absent	absent	absent
,, sulphide	absent	absent	absent
,, thiosulphate by difference .	0·1870	0·1905	0·1970 *d*
,, thiosulphate by direct titration	0·2204	0·2190	—

NOTES.—Total sulphur in *a* and *b*, by bromine oxidation; in *c*, by adding sulphur as sulphate found gravimetrically to that as sulphocyanide, *plus* thiosulphate found by distillation and given in table; in *d*, obtained by subtracting S as sulphocyanide alone from S as sulphocyanide and thiosulphate estimated together.

The tests *a*, *b*, and *c* were on liquor before boiling in contact with air for 20 minutes. Boiled liquor for *b* gave ·2140 for sulphur as thiosulphate by direct titration; while for *c* such liquor gave a total of sulphur as thiosulphate and sulphocyanide of ·2950, against ·2990 for the unboiled liquor. These small differences, which lie within the errors of experiment, afford proof that ammonium thiosulphate is remarkably stable under these conditions. Confirmatory evidence is afforded by the distillation for free and fixed ammonia.

DISTRIBUTION OF CYANOGEN IN AMMONIACAL LIQUOR.

The hydrocyanic acid—present as ammonium cyanide—is determined by Feld according to the first paragraph on p. 618 of Vol. LXXXVIII. of the "JOURNAL;" and Mr. Linder finds it conveniently applied in the same apparatus as he uses for the determination of the free and fixed ammonia, which serves also for the distillation of mercuric cyanide as produced when iron cyanogen compounds are present (see paragraph 2, *loc. cit.*). This consists of a 500 c.c. round-bottom flask provided with two-hole caoutchouc stopper, with the inlet tube sealed in liquor and the exit tube connected through a catch bulb to a Liebig condenser and receiver. It is safer, in distilling off HCN, to seal the exit tube of the condenser in the 25 c.c. of N/1 caustic soda with which the receiver is charged—a precaution not necessary when NH_3 is being estimated. The results obtained in the case of a liquor from the Batley Gas-Works are given in Table IV.; and the procedure was as follows: 25 c.c. of liquor were run into 30 c.c. of 20 per cent. lead nitrate solution diluted to about 150 c.c., distilled 25 minutes into 25 c.c. of N/1 soda, distillate diluted to about 400 c.c., a crystal of potass-iodide (about 0·2 gramme) added, and the solution titrated on N/10 silver nitrate—N/10 $AgNO_3$=3·15 c.c. Whence HCN per 100 c.c. of liquor = 4 × 3·15 × ·0054 = ·068 gramme "hydrogen equivalent (HE) = $\frac{\cdot 068}{\cdot 027}$ = 2·5.

The method for ascertaining the cyanogen content of ferrocyanide and ferricyanide, as devised by Feld (see paragraph 2, *loc. cit.*), has been carefully tested with a view to its application for the estimation of ferrocyanide in ammoniacal liquors. To this end, analysis has been made—not only of representative samples from gas-works containing all the constituents common to such liquors—*e.g.*, sulphocyanide, thiosulphate, sulphide, &c.—but also of pure solutions of potassium ferrocyanide, and of samples specially prepared by the addition of known amounts of that salt to gas-works liquors of known composition.

The use of the same apparatus [already described] for the estimation of free and fixed ammonia, hydrocyanic acid, and ferrocyanide is an advantage much appreciated in the complete examination of gas liquors, where analyses have to be promptly made to avoid undue exposure of the sample to air. Using this, the procedure finally adopted as reliable is as follows: It is substantially that indicated by Feld.* Volume of gas liquor taken, 250 c.c.; solution boiled 20 minutes to expel volatile salts, a moderate excess of 6N soda added (amount calculated from the fixed NH_3 found), and the boiling continued for a further 15 minutes to remove the fixed NH_3 and bring separated ammonium ferrous ferrocyanide into solution. Cool, make up to 250 c.c. To 50 c.c. of the solution diluted to 100 to 150 c.c. and raised to the boil, add 10 c.c. of 4N caustic soda, followed by 30 c.c. of 3N magnesium chloride ($MgCl_2$), added slowly to avoid formation of clots, boil for 5 minutes, add 50 to 100 c.c. of a boiling solution of N/10 mercuric chloride, and continue the boiling for (not more than) 10 minutes. The liquor is then distilled for 20 minutes with 45 c.c. of 4N sulphuric acid into 25 c.c. of N/1 caustic soda. To the distillate add a pinch of lead carbonate and filter, dilute to 400 c.c., add a crystal (about 0·2 gramme) of KI., and titrate on N/10 silver nitrate.

* See "JOURNAL," Vol. LXXXVIII., pp. 618-9.

TABLE III.—*Estimation of Ferrocyanide—Feld's Method.*

	Conditions.	Acid Used for Distillation.		Ferrocyanide per 100 c.c. in terms of $(NH_4)_4FeCy_6$.					Reference Letter.
				Quantity Taken.			Recovered as HCN.		
		$4N.H_2SO_4$.	4N.HCl.	In Gas Liquor Grammes.	Added Grammes.	Total Grammes.	Weight in Grammes.	Per Cent. of Total Taken.	
A	Potassium ferrocyanide alone present . .	with	—				0·1385	F.	(*g*)
	,, ,, ,, ...	—	with			0·1385	0·1385	100	(*g*)
B	Pot. ferrocyanide and 20 c.c. $\frac{N}{10}$ NH_4CNS.	with				0·1385	0·1385	100	(*h*)
	Organic matter absent.	—	with	—	—	0·1385	0·1365	98·5	(*h*)
C	Amm. ferrocyanide in gas-works liquor—								
	(*a*) Free and combined NH_3 removed by boiling, first alone, and then with soda								
	Gas-works liquor No. 1; 50 c.c. used . .	—	with				(*a*) 0·011, (*b*) 0·012, (*c*) 0·014 — ·0125*		
	,, ,, No. 2 ,, ,, . .	with	—				0·1015	F.	
	,, ,, ,, ,, ,, . .	—	with	0·10.5	—	0·1015	(*a*) 0·097, (*b*) 0·099, (*c*) 0·059 — ·0985	97	(*i*)
	,, ,, No. 1 ,, ,, . . + pot. ferrocyanide . .	—	with	0·0125*	0·1385	0·1510	0·1500	99	(*i*)
	,, ,, No. 2 50 c.c. used . . . + pot. ferrocyanide . .	with	—	0·1015	0·1385	0·2400	0·2400	100	(*i*)
	(*b*) Free ammonia only, removed by boiling—boiled liquor made up to given volume								
	Gas-works liquor, No. 1, 50. c.c. of partially settled liquor taken	—	with	0·0125*	—	0·0125	(*a*) 0·0085, (*b*) 0·0065 — ·0075	60	(*j*)
	Gas liquor No. 2, 50 c.c. of partially settled liquor taken	—	with	0 1015	—	0·1015	0·058	57	(*j*)
	Mixture—50 c.c. partially settled liquor + potassium ferrocyanide	—	with	0 0125*	0·5530	0·5655	0·5520	98†	(*j*

NOTES.—F. Taken as correct according to Feld's researches. * Approximate only, as HCl was used for the final distillation. † The loss (·0135 gramme) in this experiment is more than the ammonium ferrocyanide in the gas liquor taken. In the percentage calculation, this loss is masked by the large amount of ferrocyanide added. (*g*) Show (in confirmation of Feld) that either HCl or H_2SO_4 may be used to liberate HCN from mercuric cyanide in the final distillation when ferrocyanide alone is present. (*h*) Show that (in confirmation of Feld) the full equivalent of HCN is only obtained when H_2SO_4 is employed in the final distillation; results with HCl being 2 to 3 per cent. lower when ferro and sulpho cyanide are both present. Organic matter absent. (*i*) Show again that distillation with H_2SO_4 yields the more accurate results. (*j*) Show serious discrepancies between duplicate experiments on the same sample with identical procedure; results showing a failure to recover from an ammoniacal liquor the whole of a known amount of ferrocyanide added to it. Such losses were found to be due to the separation of ammonium ferrous ferrocyanide $(NH_4)_2$ $Fe_2(CN)_6$ in an insoluble form from the solution obtained after boiling off the volatile salts of ammonia before removal of an aliquot portion for the estimation of the soluble ferrocyanide $(NH_4)_4Fe(CN)_6$ by the method described by Feld. This insoluble ferrocyanide is readily brought into solution again as ferrocyanide by boiling with NaHO to expel the fixed ammonia, NH_3; and this precaution must not be omitted in cases where it is desired to prepare a large volume of liquor for a series of ferrocyanide estimations.

TABLE IV.—*Analyses of Ammoniacal Liquor from Gas-Works.*

Liquor from Gas-Works.	Density in Degrees. Twaddel.	Ferrocyanide as $(NH_4)_4$ $FeCy_6$ Grammes per 100 c.c.	Chloride, calculated as HCl. Grammes per 100 c.c.	Distribution of Sulphur. As Sulphate, Sulphur per cent.	As Sulphocyanide. Sulphur per cent.	As Sulphite and Thiosulphite, by difference. Sulphur per cent.	As Sulphide. Sulphur per cent.	Total Sulphur. Grammes per 100 c.c.	Per cent. Sulphur to Ammonia.	Ammonia. Total. Grammes per 100 c.c.	Fixed, Grammes per 100 c.c.	Free. Grammes per 100 c.c.	Free. H.E. A.	Carbonic Acid. Grammes per 100 c.c.	Carbonic Acid. H.E. B.	Sulphuretted Hydrogen. Grammes per 100 c.c.	Sulphuretted Hydrogen. H.E. C.	Hydrocyanic Acid. Grammes per 100 c.c.	Hydrocyanic Acid. H.E. D.	Total Acids— B+C+D; H.E.	Difference of Acids— B+C+D−A; H.E.	Difference of Acids— B+C+D−A; NH_3 H.E. = 100.	Per cent of Total Acids. As H_2S	Per cent of Total Acids. As HCN.
No. 1	6·3	·012	·776	0·7	23·4	3·1	72·8	·8547	31·1	2·752	·576	2·176	128·0	2·551	116·0	·66	38·9	·068	2·5	157·4	+ 29·4	+ 23·0	24·3	3·2
No. 2	5·5	·101	·326	26·9	22·4	12·2	38·5	·6552	34·2	1·915	·447	1·468	86·4	2·057	93·5	·268	15·8	·003	0·1	109·4	+ 23·0	+ 26·6	14·4	0·2

NOTES.—Liquor No. 1 was from the Batley Gas-Works. The proportion of SH_2 in the gases is decidedly large; but also the gases are associated with HCN in larger quantity than those found in any sample of gas liquor examined, except that from the South Metropolitan Company's Old Kent Road works (see 1903 Report, pp. 60 and 71). Liquor No. 2 was from a works where a cyanide-extraction process is in operation preceding the ammonia-abstracting plant. In this case, it will be noted that the amount of ammonia as sulphate is high. This incidentally proceeds from reactions in the cyanogen extraction process. There is, however, a certain amount of cyanogen compounds, not recovered as ferrocyanide, and passing on to the ammonia scrubbers and washers as shown by the sulphur and ammonia as sulphocyanide (see Table V.). A test made in 1903 of the gases leaving a saturator at the Old Kent Road works showed 8·81 grains of hydrocyanic acid (HCN) and 5·57 grains of ammonia (NH_3) per cubic foot.

Ammonium ferrocyanide $(NH_4)_4$ $Fe(CN)_6$, grammes per 100 c.c.

$$= 2 \times \cdot00947 \times \text{c.c.} \frac{N}{10} AgNO_3.$$

Mr. Linder concludes his memorandum by giving a case where a liquor tested by the method just described gave 0·1505 gramme of ammonia ferrocyanide per 100 c.c.; but when estimated by the Prussian blue $[Fe_7(CN)_{18}]$ produced therefrom, it showed only 0·1260, and again, calculated from the oxide of iron obtained by solution of the latter in HCl and reprecipation by NH_3 in the usual way, showed 0·1401 gramme—thus indicating that, in the presence of organic matter, the quantitative separation of ferrocyanide as Prussian blue cannot be relied upon.

The following summary of results of tests in recent years is given by the Chief Inspector:—

TABLE V.—*Comparison of Tests of Gas Liquor, Expressed in Grammes per Litre.*

Origin.	Total Ammonia NH_3.	Ammonium Hydrosulphide NH_4SH.	Ammonium Sulphocyanide $NH_4CN.S.$	Prussian Blue $Fe_7(CN)_{18}$.	Ammonium Ferrocyanide $(NH_4)_4$ $Fe(CN)_6$.
From a "Standard" washer at Bremen (*a*)	43·10	0·985	0·082	0·110	0·109
Leicester . . . . (*b*)	17·28	3·43	3·27	..	..
South Metropolitan, Old Kent Road . . . (*c*)	19·72	7·84	3·16	..	..
Batley No. 1 of 1904 . (*d*)	27·52	9·92	4·54	0 126	0·125
,, No. 2 ,, . (*e*)	19·15	4·02	3·49	1·024	1·015

NOTES.—(*a*) On the authority of Herr Feld. (*b*) and (*c*) *vide* alkali report for 1902 and 1903, comparing methods of estimating sulphocyanide. (*d*) and (*e*) tests of liquors given in detail Table IV., to which Feld's method for estimating ferrocyanide have been applied, as set forth in the memorandum of Mr. E. Linder, B.Sc. *b*, *c*, *d*, *e* represent liquor from every department of the gas-works. The results are expressed as ammonium ferrocyanide (molecular weight 284 × 3), and alternatively as Prussian blue (molecular weight 860). Ferrocyanide is rarely found in appreciable amount in English ammoniacal liquors.

We cannot conclude this survey of the fortieth annual report without expressing high appreciation of the valuable work done by the Chief Inspector and his experimental assistants.

THE PREJUDICE AGAINST GAS-FIRES AND SOME OF THE CAUSES.

By E. D. W.

The great extension of the use of coal gas for heating purposes may be taken as proof that the prejudice with which they were at first regarded has abated to a considerable extent. It would, however, be idle to ignore the fact that the prejudice still existing is extensive, and is based generally on one, or both, of two contentions—viz., that gas-fires are "expensive" and "unhealthy."

On the question of economy, gas engineers and others have written much and often; and if they have not succeeded in proving that the cost of fuel per heat unit is as low in the gas as in the coal fire, they have been able to point out sundry economic advantages—such as the real saving of labour—possessed by the former, and have also instanced many cases of intermittent use in which the gas-fire has a distinct advantage on the score of expense. The relationship of the use of the gas-fire to health has, however, been less frequently dealt with, although it is apparently on this account that a great deal of the present prejudice exists. It will hardly be denied that such a prejudice does still exist, and that its existence presents a serious obstacle to the gas-fire becoming the rule rather than the exception; its undoubted advantages of convenience and cleanliness over the coal-fire being neutralized to a great extent by the reiterated objection of its "unhealthiness."

It then becomes necessary to consider whether a gas-fire is, in fact, unhealthy, and, if so, in what manner does it have an injurious effect on the health, and what remedies can be found to obviate the trouble. Perhaps it is well to attempt to discover what is behind the statement "unhealthy" in the minds of those prejudiced against gas-fires. When, therefore, we hear statements that gas-fires are unhealthy, the author of such a statement should be questioned, and, if possible, his theory of the how, why, and wherefore of the alleged injurious effect thoroughly discussed. If this method is followed, some very curious and varied theories will be propounded. Discarding many absurd answers made—mostly by people who are prejudiced without having thought on the matter at all, or by others whose ignorance of elementary science renders them quite unfit to form an opinion—we shall find that the answers given by the more serious and enlightened section of the community will probably be:

1.—That a gas-fire *smells*—at all events when first lighted.
2.—That some of the fumes escape into the room.
3.—That it renders the air of the room unpleasantly and unhealthily dry.

The first of the answers is soon dealt with. No well constructed gas-fire, if properly fixed, should smell, except for a minute or two when first lighted. The cause of the smell for the first minute or two is, of course, the coldness of the chimney, with perhaps a little down-draught, which, until it is slightly warmed, allows a portion of the products of combustion to escape into the room. The same thing occurs when a coal-fire is lighted, as can be judged by the smell of burning wood, which is almost invariably noticeable. In either case, this very trifling difficulty can, if it is thought necessary, be overcome by making sure of the existence of an up-draught before the fire is lit. This can generally be obtained by a little manipulation with windows, ventilators, and doors, a lighted taper held in the flue serving as an indicator.

The remaining two answers really arise from the same cause—viz., that many people state that, after sitting for some time in a room heated by a gas-fire, their throats and tongues become very dry, and it is sometimes averred that the excessive dryness of the air gives a hard and cracking appearance to the skin of the face and hands—none of which inconveniences occur in a room heated by a coal-fire. Now, in the first place, does a gas-fire really cause the atmosphere of the room in which it is used to have this effect? And, in the second place, if the effect is admitted, what is the cause? There is, unfortunately, little doubt that the dryness of the throat, &c., which is complained of by the occupants of a room heated by a gas-fire is caused indirectly by the gas-fire, though the disagreeable symptoms can readily be obviated, if proper attention is paid to the fixing of the fire and to the ventilation of the room. The dryness of the throat, &c., being thus admitted, What causes it? Is it the dryness of the atmosphere, the escape of fumes, or some other less obvious cause?

Let us consider the question of atmospheric dryness first. It is difficult to see why a gas-fire should dry the air of the room it heats, more than a coal-fire does; and, if the two systems are tried fairly and under the same conditions, it will be found that it does not do so. But, as usually fixed, the gas-fire is very heavily handicapped. The coal-fire sends the products of its combustion up a flue, measuring on the average (say) 10 in. by 6 in.; so that not only do the products of combustion pass up this channel, but also a considerable quantity of air from the room, which has not passed through the fire. The gas-fire, on the other hand, is fitted with a flue-pipe averaging 3 inches in diameter; and this flue-pipe has generally little or no space between it and the wall through which it passes. Even when the gas-fire is placed in front of an

ordinary coal-grate, the opening of the latter is nearly invariably filled in with sheet iron. Under these conditions, the gas-fire is a much less efficient ventilating agent than the coal-fire; the air of the room it heats is not changed so frequently; and the reduction in the proportion of water vapour relative to the temperature, as increased by the gas-fire, is not sufficiently compensated for by the influx of moist external air. There is, consequently, an actual dryness of the air in most rooms heated by gas-fires. A few rough experiments will readily prove this. If two rooms of about the same cubical capacity are kept at the same temperature—one heated by gas and one by coal—and into each is introduced a sheet of blotting paper (or other absorbing agent such as cotton waste, or pieces of cloth of the same texture and size) which has been moistened with a measured quantity of water, it will be found that the one in the gas-heated room will dry the quicker of the two; and although the experiment is, of course, rough, yet a few repetitions of it will enable the operator to convince himself.

In most cases, a sufficient remedy is to enlarge the opening round the flue, or in the case of fires fitted in front of a coal-grate, to do away with the sheet iron blocking up the opening. It is unfortunately true that both these remedies tend to diminish the heating effect per cubic foot of gas consumed. Another method, and one very widely followed, is to place a vessel containing water near the fire, in order that the water vapour given off may replenish the moisture of the air. This can never be so satisfactory as really efficient ventilation; but if the surface of the water be sufficient, and the vessel be properly placed with reference to the position of the gas-fire, the trouble will, in many cases, disappear. Unfortunately, the popular notion is to place such a vessel quite close to the gas-fire, usually under the trivet and in the direct line of the current of air to the fire, so that the bulk of the water vapour is drawn into the fire, and the effect on the air of the room is scarcely appreciable. It is like using a bronchitis kettle with the spout turned up the chimney.

With regard to the question of the escape of fumes, there can be no doubt that the gas and coal fires are on terms of equality. In most fires of both sorts, there is a very slight leakage of fumes, and also the products of combustion are, as it were, spilt, occasionally—mainly owing to sudden draughts caused by the rapid opening or shutting of a door, or by movements of persons in the room; the skirts of a woman when she moves quickly in front of the fire having a very noticeable effect. A proof of this slight leakage of fumes is that if some substance which on burning produces a penetrating odour, is placed on the fire, the smell caused by its combustion can usually be detected in the room. If anything, the gas-fire seems, by this test, to allow less of the products of combustion to escape than the coal-fire. Another proof that the escape of fumes from a gas-fire is very slight is the dryness of the atmosphere in most gas-heated rooms; for a large proportion of the products of combustion of gas being water vapour, it is obvious that the escape of any considerable quantity would keep the atmosphere moist, whatever other objectionable effects it had.

The probability is that in both the coal and the gas fire the escape of fumes is a quite negligible quantity, when both fires are well fitted and good of their kind. But the coal-fire has the advantage that, when fumes do escape, the effect is obvious and visible, while, the fumes of a gas-fire being invisible, the cause of the bad atmosphere of the room is not so apparent. Many a badly burning gas-fire is connected to a faulty flue, which would make a coal-fire burn equally badly and smoke into the bargain. Indeed, it is not an uncommon thing, if a coal-fire in a certain room has what is known as a "smoky chimney," for a gas-fire to be fitted as a remedy for the trouble, without anything being done to put right the faulty flue, which is at the root of the mischief.

In fixing gas-fires, then, it is most important that the question of ventilation should be well studied. This is particularly imperative if the fire is fixed in a bedroom, when, on no account, should the opening of any existing flue be filled in. With a well-ventilated room, and the products of its combustion passing up a flue which "draws" well, the gas-fire will be found to be no more unhealthy than a coal-fire; and as the economic question will tend to become less acute with the gradual advent of cheap gas, there should be every hope that the heating of dwelling-rooms of all sorts by gas will spread much more rapidly than in the past.

Sulphate of Ammonia as a Manure.—At the recent Brewers' Exhibition at the Agricultural Hall, of which a notice appears elsewhere, evidence was afforded, in the entries for the malting barley competitions, of the continued use of sulphate of ammonia, either alone or in combination, as a manure. This year, however, no prizes were offered by the Sulphate of Ammonia Committee for the best samples of barley grown by its aid.

Yorkshire Junior Gas Association.—The annual meeting of this Association will be held on Saturday, in the University Buildings, Leeds. The general business will, as usual, be followed by a lecture, to be delivered by Dr. G. R. Thompson, Professor of Mining at the University; his subject being "The Utilization of Fuel." The lecture is an excellent feature of the annual meeting of this Association; and already the members have been able to listen to discourses by Professor Smithells and Mr. Doig Gibb. They are to be congratulated on having this year secured the services of Professor Thompson.

THE THERMOMETER AS A GAUGE OF ECONOMY IN COAL CONSUMPTION.

Prominent among the checks to undue consumption of coal in steam and power plants, may be mentioned systematic attention to the temperature of feed water to the boiler and of the waste gases escaping from the stack. To gauge this, special thermometers are necessary, inasmuch as the ordinary form will not give true indications, because of not being subjected to the same conditions in use as when made. For a thermometer to show correct indications of temperature, it must be constructed under the same or very similar conditions to that in which it will be eventually used.

The following illustrations and description show improved forms of thermometers suitable for boiler use, now being placed upon the market by the Hohmann and Maurer Manufacturing Company, of Clerkenwell Road, E.C.

Fig. 1 illustrates a thermometer for feed water, made with a detachable socket. Fig. 2 shows the socket detached. The socket or well is closed at the lower end, so that no water can pass through when the thermometer is removed. The cap is only used to keep out any dirt or grit when the thermometer is not attached; otherwise it might injure the usefulness of the instrument. The socket is first attached to the apparatus where it is intended to remain permanently; and then the thermometer is inserted and secured by screwing down the union-nut with the fingers. There is no filling required, as there is close contact between the stem of the thermometer and the shell of the socket—thus insuring the instantaneous transmission of heat without loss. The two parts being machined to exact measurements, one thermometer can be used with any number of sockets; and this will be found advantageous where it is desirable to make only occasional tests in different parts of a plant. The separable well will recommend itself particularly for cramped positions, as it permits the use of either the straight or angle type, and eliminates the necessity of revolving the case when attaching. The metal used in the socket is a non-corrosive composition, impervious to chemical action from either water or steam. It will not, therefore, take on any rust, which would act as a non-conductor of temperature and render such a thermometer useless for true indications.

FIG. 1.

FIG. 2.

FIG. 3.

Fig. 3 illustrates a flue-gas thermometer—said to be the result of many years of study and experimental work. In the stem construction of flue-gas thermometers, the casing is of steel, and the tube is inserted within the steel casing as shown. The space between the thermometer tube and the glass case covering it, and also between the outside of the glass casing and the inside of the shell, is filled with non-conducting material so as to increase the accuracy of the readings and protect the thermometer tube against breakage in handling.

The bulb and stem of the thermometer are of "Jena Boro-Silicate" high-resistance glass. The bore of the tube above the mercury column is filled with nitrogen gas under high pressure, which raises the boiling point of the mercury to 1000°, up to which point it records accurately. The flange as shown on the stem of the thermometer is adjustable, and permits of applying it in the uptake or smoke-stack at any depth desired. It can be used in a horizontal as well as a perpendicular position. The gas pressure in the tube holds the mercury column at its proper height according to temperature exposure, and works equally as well in any position.

INVERTED GAS-BURNERS.

By Professor H. DREHSCHMIDT, Chemist of the Municipal Gas Undertaking of Berlin.

(*Concluded from p.* 175.)

Some of the patterns selected have since been improved by their inventors, and do not represent the present output of the makers concerned. The author's experience is that the burner which gives the best results is one in which there is preliminary heating of the primary air supply. Further trials may reveal other burners equally good, or perhaps better; and the gas industry will benefit the more good burners there are competing with one another in the market. The results of the comparative trials of the light afforded by four inverted burners have been already given in tabular form on p. 101 of the "JOURNAL" for July 11 last, and the annexed diagrams, figs. 3 and 4, display them graphically. The burner G is an old inverted burner which is without any proper lateral discharge of the products of combustion; P is a burner in which the products are carried away on all sides by means of a deflecting plate; W has a chimney tube and a hemispherical globe closed below; while M is a burner in which the primary air is previously heated and the products of combustion are carried off on one side only.

Fig. 3 shows the distribution of the light of these four burners and of the ordinary Welsbach burner in different directions. The actual intensity has been disregarded, and the illuminating power in a horizontal direction is taken as equal in every case to 100. With the Welsbach burner, only 45·8 per cent. of the light is thrown below the horizontal; whereas with the inverted burner W, the proportion is 63·1 per cent., and with M 65·5 per cent. The distribution of the light over the lower hemisphere is also most satisfactory with the burner M. Not only is the radiation directly downwards good, but the radiation sideways is also good enough to afford satisfactory general illumination; while even

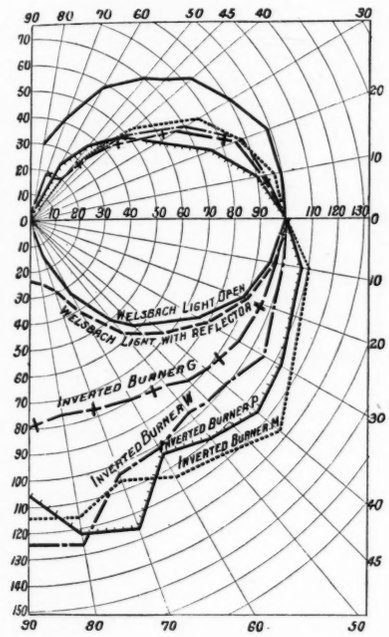


FIG. 3.

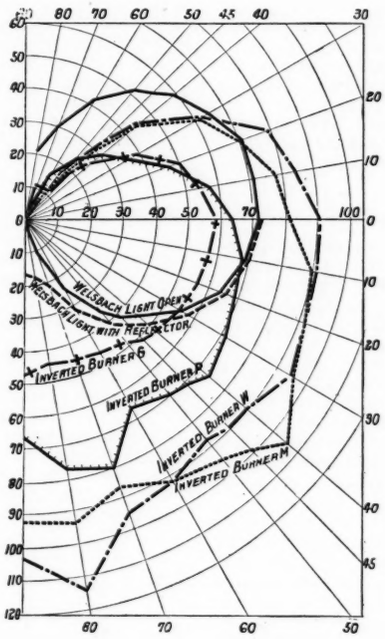


FIG. 4.

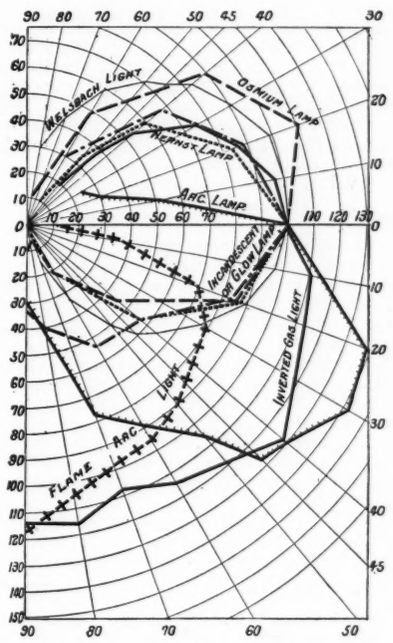


FIG. 5.

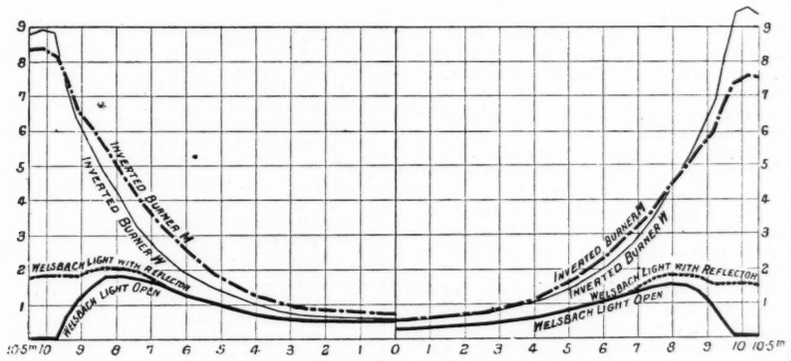


FIG. 6.

upwards there is sufficient light from this burner to prevent the ceiling of the room being in darkness. If desired, this upward light could be deflected downwards by means of a reflector, which can be fitted more satisfactorily to the inverted than to the ordinary incandescent gas-light.

Fig. 4 is perhaps even a more interesting diagram. It shows graphically the light in Hefner units obtained per 100 litres (3·53 cubic feet) of gas consumed in the different burners. [One Hefner per 100 litres = very nearly ¼-candle per cubic foot.] It will be seen from this diagram that, with the exception of burner G, the inverted considerably excels the ordinary incandescent light in regard not only to the lower hemispherical light, but even to the total spherical brightness. The superiority of the inverted burner in the most essential particular—viz., mean lower hemispherical brightness, is shown from the gas consumption per candle-hour, which amounts to 0·08 cubic foot with the ordinary upturned incandescent burner, and 0·043 cubic foot with the best inverted burner. It is quite unnecessary to discuss these curves further, as they show clearly the great superiority of the inverted burner.

It will, however, be profitable to compare the distribution of the light with that of the electric light, which is the principal competitor with incandescent gas lighting, and to see how the inverted gas-burner stands in regard to the competition in that particular as distinct from cost. This comparison is made diagrammatically in fig. 5, in which the horizontal illuminating power is taken as equal to 100, except in the case of the flame arc light, of which the horizontal value is very small. Its greatest lighting power is at 90° below the horizontal; and this has been taken, for the purpose of the diagram, as equal to that of an inverted gas-burner at 80° below. It will be seen that the carbon filament electric glow lamp, the Osmium, and the Nernst lamp with vertical filament, all develop nearly as much light above and below the horizontal, and so stand at a palpable disadvantage as compared with the inverted gas-burner. The flame arc light, although it emits all its light downwards, is inferior to the inverted gas-light, because it has too little lateral lighting power. It is only adapted for lighting powerfully a small area directly under it, and is not fitted for a more general illumination, either of rooms or streets. The ordinary electric arc light develops most light in the lower

hemisphere; being strongest at an angle of 30° below the horizontal. But both horizontally and vertically downwards it is relatively inferior to inverted gas lighting, which shows therefore a more favourable distribution of its light for most applications. In the author's opinion, the curves demonstate that the inverted gas-light of the best type distributes its light far more favourably than any kind of electric light.

The latest types of inverted incandescent gas-burners afford more lateral illumination than the older ones; and it therefore seemed worth while to study their effectiveness for street lighting. Fig. 6 shows graphically the illumination of the surface between lanterns placed 21 metres (nearly 69 feet) apart, and with the light 12 ft. 1½ in. from the ground, for the inverted burners referred to as W and M, and ordinary incandescent gas-burners, with and without reflectors. The left half of the diagram refers to the burners with the horizontal illuminating power taken as equal to 100; the right-hand side to the same burners at their absolute illuminating power. In both cases the inverted burner is seen to be superior. Lately, therefore, practical trials of the inverted burner have been undertaken in the streets of Berlin. But a blunder was made at the outset in putting the burners into the old street-lanterns, whereby sharp shadows from the metal parts of the sides and bottom of the lanterns were cast on the pavement. Further trials are in progress with a pattern of lantern which does not cast shadows.

The author hopes that his communication will serve to dispel the mistrust of the inverted incandescent gas-burner which prevails in some quarters, and to indicate clearly its importance and value.

Discussion.

The discussion was opened by Herr Söhren, of Bonn, who inquired if the author had measured the current in his investigation of the electric arc lamps. The "Excello" flame arc lamp consumed only half as much electrical energy as other electric lamps; and he (Herr Söhren) had displaced all others under his control by it.

Professor Drehschmidt replied that the curves he had given relating to electric lighting were not deduced from his own work, but from the researches of electricians. The arc lamp figures referred to the ordinary arc lamp; and it was the manner of distribution of the light rather than the current consumption which was involved. It had frequently been demonstrated that gas could compete with the arc light notwithstanding low current consumption.

Herr Andrae, of Leverkusen, near Cologne, asked whether Professor Drehschmidt had made experiments with gas other than coal gas, as his own experience was that water gas, even when uncarburetted, was very well suited for use with inverted gas-burners. The fact that it could not produce smoke was advantageous to it. Professor Drehschmidt replied that he had had no opportunity of trying water gas in inverted burners; but he was quite prepared to believe that it gave very good results on account of its high flame temperature. The smoking with inverted burners was due to the faulty construction of them, as it did not occur with the newest type of burner. The ordinary incandescent burner could be made to smoke by improper regulation of the air-inlets. A certain amount of attention was necessary with any incandescent gas-burner.

Herr Meyer, of Sondershausen, said that the inverted incandescent burner had already assumed great importance and was of considerable interest to the gas managers of every town. The inventors of it had at first aimed at imitating the electric light, but later at providing a better light. It was difficult to introduce a novelty; and there were now so many new burners that the experimental works of the German Association might profitably start an examination of them with a view to deciding which were the best.

Dr. Bunte, Professor at the Carlsruhe Technical College, said that the experimental gas-works would attack such problems as the examination of burners; but too much must not be expected of it in this direction, seeing the many matters in connection with the gas industry, now advancing with such rapid strides, which required investigation. It was highly gratifying to have the results of Professor Drehschmidt's careful investigations; and the meeting was deeply indebted to him for his communication.

Herr Schomburg, of Gelsenkirchen, said that he had tried a number of varieties of inverted gas-burners. He regretted that many of them had proved quite unsuitable for general introduction. But when these had been weeded out, and satisfactory varieties only supplied, the inverted burner was liked by consumers, and several had stated that they had through its advent been restrained from adopting electric lighting. Professor Drehschmidt's valuable investigations would prove of great assistance to all in selecting inverted gas-burners.

The President (Herr Körting, of Hanover) in expressing the hearty thanks of the meeting to Professor Drehschmidt for his paper, said that other gas men ought also to make researches on the inverted burner, with a view to attaining results with it which would be of benefit to the industry at large.

Mr. T. H. Hazell, the Secretary of the Newport (Mon.) Gas Company, has been admitted a Fellow of the Chartered Institute of Secretaries.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

The Seventh Annual Meeting of this Association was held at the Exchange Hotel, Manchester, on Saturday; and there was a good attendance of members.

The Secretary (Mr. A. L. Holton), in presenting the annual report, stated that it was very gratifying to show a substantial increase in the membership roll. This was largely the outcome of a circular-letter soliciting the aid of every gas engineer in Lancashire and Cheshire, and the use of printed application forms. A further growth of the membership was still to be expected. The balance-sheet showed a decrease on the preceding year, owing to the establishment of a reference library, in which there were some 80 volumes. Though the number of papers read during the past year had been few, they had been contributed by their own members, and were of a highly technical and scientific character. The Council hoped, however, that with the increase of membership a larger number of papers would be forthcoming.

The election of officers followed; the result being that Mr. Ginman was chosen for Vice-President, and Messrs. Garlick and Holton were re-elected Treasurer and Secretary respectively. From eight nominations for the Council, the following were elected: Messrs. Oldfield, Alsop, H. Smith (retiring President), Taylor, Teasdale, and Thorpe. Messrs. C. Berry and J. Wareham were reappointed Auditors.

Mr. Smith said, before relinquishing office, he should like to thank the members of the Council for the support they had always given him. The duties had been very pleasing, though he had not been able, through illness, to do as much as he had wished. It was also a great pleasure to hand the presidency over to Mr. J. E. Dudley, who had done valuable work on the Council for two or three years; and he would now ask his successor to take his place.

Mr. Dudley sincerely thanked the members for the honour they had conferred upon him in electing him President of the Association. He assured them that nothing should be wanting on his part, with the assistance of their worthy President, to endeavour and do justice to the position equal to that of his predecessors. It was pleasing to note the steady progress the Association was making, as it gave the Council the assurance that their efforts were being rewarded with lasting success. He would sincerely urge upon the members the importance of being more diligent in their work, to take advantage of the classes on "Chemistry" and "Gas Manufacture," and, above all, if they were determined to become successful gas engineers, to get themselves thoroughly grounded, as practical men had the whole business between their finger and thumb and were better able to cope with the difficulties. They knew they had at times to face very serious ones, which needed something more than theory to overcome. He had had some of the most dangerous to contend with; and therefore he could speak from experience. What were the men who laid the foundations of their great industry—Murdoch, Malam, and Clegg? It could truly be said that they were the great practical men of their day. Their apparatus was certainly in a primitive form; but if the members would look carefully and thoughtfully at the various portions of gas-making plant working at the present time, they would see impressions or finger-prints of these great men who had been the means of building up a world-wide industry. The labours of their lives were the foundations upon which the industry stood to-day. The apparatus of the present day was more elaborate; but was it more carefully devised? Was the seriousness of thought given to it that there ought to be? He did not think sufficient care was taken at times to consider some inventions; and consequently old ideas were often being reintroduced.

He would like to suggest at this point that more of the members should attend the lectures and visits. There was nothing so pleasing to the engineers who invited them to inspect their works as to see a good company. It was not sufficient that they should content themselves with the idea that they were members of a Gas Association. He would impress upon them not to be silent members. Silence might be "golden;" but the golden opportunities of junior gas engineers were awakening. They must be all up and doing. Every member must be active. He, for one, would not like to see the Association lagging behind. They had in their midst young men who were capable, and who only needed to put on a determination to excel in the work they had in hand. They must bear in mind that they lived in an age of keen competition. Their Association did not now exist alone. They had competitors in kindred Associations; and it was very important that the kinship of the Associations, and also the "Gas Manufacture" classes formed, should be directly connected with the gas industry, or the time might come when it would be said of the junior gas engineers, as had been recently said about a great number of persons who had prepared themselves for taking positions as electrical engineers, that there were so many of them that they became a glut in the market. It remained with the Junior Gas Associations to sustain the traditions of gas engineering; and he trusted that their Association would continue to hold a supreme position in this respect.

It was interesting to watch the growth of the various Junior Associations which had been founded, and the interest taken in

their formation by the Senior Gas Associations. It gave more encouragement and brighter hopes to young men who were desirous of advancing in their profession. The Association of Gas Managers—the British—was founded in Manchester on May 11, 1864; and it would perhaps interest those present to know that in 1866 a Gas Students' Association was formed at the Oldham Gas-Works by the late Engineer (Mr. J. Chadwick), of which he (Mr. Dudley) was an active member, and the library of which existed at the present time. He might say that Mr. Chadwick gave them, as students, plenty of latitude, and was always pleased to see them seeking information on the works. He (Mr. Dudley) firmly believed that if more scope was given to promising young men on gas-works, far better results would be realized. They spent their time in preparing for better positions; and very often to no purpose, through no fault of their own. He earnestly pleaded for more consideration by gas engineers for their juniors. The question of assisting them had been under consideration for some years, without any very definite results so far. He thought it time the "leading lights" woke up more to the importance of the training of their young men. What he would impress upon them was that English students had brains if they would only use them in the right direction. He concluded by appealing to the members to take every possible interest in the Association.

Mr. HOLTON said it was not customary to discuss the President's Address; but he had great pleasure in moving a vote of thanks to him for his very able speech.

Mr. GINMAN seconded the motion; and it was carried unanimously.

The PRESIDENT having briefly responded,

Mr. MOTTRAM proposed a vote of thanks to the retiring President and officers, which was seconded by Mr. WAREHAM, and unanimously adopted.

Mr. SMITH, in acknowledging the vote, said he must thank the members for their loyal support. A great deal of the success of the Association was due to the Secretary and Council, who had done remarkably well; and everybody, he thought, was greatly indebted to Mr. Holton.

Messrs. HOLTON and GARLICK thanked the members on the Council's behalf; and the meeting concluded with a smoking concert.

Travelling Platform over Retort-House Subways.

Mr. F. Scott, the Engineer and Manager of the Galashiels Gas-Works, has written to point out, in reference to the particulars of the device for operating Messrs. Dempster's and his own patent travelling platform, which appeared in the "JOURNAL" for the 10th inst., that the platforms as made for Galashiels and other gas-works on their system do not require any mechanical means for propelling them along the retort-house. They are fitted with ball-bearings; and he says "they run so easily that they can be pushed with the hand from one setting to another."

London and Southern District Junior Gas Association.

The opening meeting for the forthcoming session of the London and Southern District Junior Gas Association will take place next Friday, at the Regent Street Polytechnic, when Mr. E. E. Grimwood will read a paper entitled "Measurement of Artificial Illumination." The programme for the session is not yet complete; but among the contributions already promised are the following: "Naphthalene Complaints," by Mr. W. A. Vanner; "Methods of Determining Photometric Values," by Mr. J. Clark; and "Notes on Materials for Concrete Tanks, &c.," by Mr. R. H. Brown. There are also other papers in view, as well as several visits, including one to a London incandescent mantle factory.

High-Pressure Gas and Inverted Lights.

The patent record in the last volume of the "JOURNAL" made known the fact that the James Keith and Blackman Company, Limited, are turning attention to the application of high-pressure gas to inverted burners; but the combination of the two systems has not yet been fully developed. Experience of a very gratifying character, however, has been obtained by the firm in the adaptation of the "Bijou" size of burner to high-pressure gas for billiard-table lighting. Regulated, these burn 1 cubic foot of gas per hour on high-pressure, and, allowing six per table, most efficiently do their work. They are the pink of even and well-lighted billiard tables. When it is remembered that only 6 cubic feet of gas per hour are used, at a cost of less than ½d. per hour, this is certainly a very striking instance of the economy of high-pressure gas lighting.

We learn from the "Leeds Mercury" that some members of the Corporation are manifesting interest in the scheme which (on the initiation of Mr. J. H. Brearley) is being carried out at Longwood for enabling the boys in the upper classes of the public schools to visit the gas-works—an account of which appeared in the "JOURNAL" for the 3rd inst., p. 36. The matter is to be brought before the Gas Committee; and it is thought this idea of practical education should be extended to the principal industries of the borough.

ARTISTIC LUSTRE FOR INVERTED LIGHTS.

In our report of the proceedings at the last meeting of the Société Technique du Gaz en France, it was stated that there were three competitors for the Society's prize for artistic fittings suitable for use with incandescent gas-burners. They were MM. Charles Blanc, Charles Boulanger, and Eugène Potron. All the fittings submitted were declared by the Committee to be worthy of substantial recognition; and, therefore, they awarded each of

the designers a silver medal. When referring to the matter at the time, our contemporary "Le Gaz" mentioned that M. Boulanger had submitted a very artistic lustre and suspension in the Louis XVI. style; and in the current issue there is given an illustration of it, which we reproduce. The fitting is made of cast metal; the dome being of Sèvres blue, with gilt stars. It carries seven burners—four being of the inverted Liais type, at the sides, and the others upright.

INTERNATIONAL PRIZES OFFERED BY THE ITALIAN GAS SOCIETY.

Three years ago, the Italian Gas Society arranged to have regular yearly competitions for the best papers contributed to their proceedings, on somewhat similar lines to those which the Société Technique du Gaz en France has adopted for so many years. To inaugurate these competitions, the Association decided at their meeting this year at Genoa to organize an international competition in connection with next year's congress, which will be held at Milan. This city has been chosen for the Italian meeting of 1906, on account of the exhibition, which, as our readers are aware, is to be held there to commemorate the opening of the Simplon Tunnel. Three prizes are offered, consisting of a gold medal and 1000 lire (£40), a silver medal and 750 lire (£30), and a bronze medal and 500 lire (£20). The subjects suggested are as follows:—

1.—Particulars of the present position of affairs relating to retort-houses and the preference to be given, either from a technical or an economical point of view, to systems of (*a*) ordinary horizontal retorts (*b*) inclined retorts, (*c*) vertical retorts. The different conditions in which works are situated, whether large, small, or medium, must also be taken into account.

2.—Particulars of the economical advantages of revivifying *in situ* spent purifying material by means of oxygen drawn in to the manufacturing plant; as to what system of this kind should be preferred; and its effect on the quality of the gas. The whole subject should be illustrated by full experiments carried out in practice.

3.—General thesis on the phenomena of electrolysis on underground pipes produced by vagrant currents or by induction connected with large electrical installations. Means of remedying or reducing the same.

4.—Although the special attention of competitors is called to the three preceding questions, nevertheless any one of the awards may, in the discretion of the Commission, be given to the author of a thesis on any subject of interest to the gas industry; but papers principally of a commercial nature will not be taken into consideration.

The judicial Commission referred to above will be presided over by Signor Luigi Della Porta, who is one of the Engineers at Milan, and a member of the Executive Committee of the Exhibition. Other members of the Commission are the General Manager of the Union des Gaz Company's Milan works (his name is not given in the official circular sent us), Signor Federico Laeng, the Manager of the Brescia Gas-Works, and the Secretary of the Italian Gas Society; Signor Leonida Spreafico, the General Manager of the Società Italiana per il Gas; and Signor H. I. Henry, the Gas Manager at Genoa.

Other details in connection with the competitions are also given. Should the number of papers judged worthy of prizes be less than three, the awards not made will be postponed to the following year. Papers offered for competition must be unpublished, and written preferably in Italian or French; but, in order to maintain the international character of the competition, those in English or German will also be allowed. The papers should not bear the author's name, but have some motto, which should also be given in a closed envelope, together with the writer's name, and a declaration that the paper or thesis is unpublished and will not be published for one year. The MSS., with any documents accompanying, should be sent registered to Signor Federico Laeng, Direttore del Gas di Brescia, Italy, before March 1, 1906. The papers will not be returned to their authors, but will remain the property of the Society, who will have the right to publish them in their annual proceedings. The Commissioners, from whose awards there will be no appeal, will adjudicate on the papers by an absolute majority of votes, and will give, at the general meeting of members of the Society, a reasoned report of their findings.

The foregoing details have been translated from a communication received from Signor Laeng, the Secretary of the Commission, from whom, no doubt, any further particulars could be obtained.

MECHANICAL FILTERS AT BROOKLYN.

The water supply of the borough of Brooklyn (New York City) is derived from wells and surface streams. The wells have been driven in groups along a conduit about 15 miles long leading to the city. Pumping-stations are installed at the various groups of wells, their pumps drawing directly from the wells, and discharging into the conduit or into cast-iron mains parallel to it. At two of those stations small ponds fed by springs and surface streams were formerly used as sources of water in addition to the supply furnished by the wells. These two ponds became more or less polluted, and were thrown out of use several years ago; but as the demand for water increased, their supply was required, and mechanical filtering plants have been built to purify the water. Since their completion, they have given uniformly good results. The following particulars in reference to the plants appeared recently in "Engineering Record."

One filter plant has a capacity of 5 million, and the other a capacity of 3 million, gallons per 24 hours. The plants are quite similar in design, and are operated in practically the same manner. Sulphate of alumina is used as a coagulant in the operation of both; and as the alkalinity of the raw water is frequently very low, soda-ash is also applied at times to produce the proper flocculence of the alum. The pond at the station furnished with the larger plant is about 1100 feet from the building, and is at sufficient elevation that a gravity flow takes place from an intake in the pond through a 20-inch main to a 10-inch Lawrence centrifugal pump, which raises the raw water through a 20-inch main to the filter plant, which is in a frame building adjoining the station. It consists of two sedimentation tanks and ten filter-tanks in two rows—one sedimentation tank and five filter-tanks in each row—and all on brick and concrete piers. The tanks are of circular wood-stave construction, bound by iron bands, and open at the top. The sedimentation tanks are 18 feet in diameter and 21 ft. 6 in. high in the clear. The raw-water inlet to each of these tanks from the 20-inch main from the pump enters near the bottom—a series of baffles directing and distributing the flow so as to utilize the full capacity of the tank. The water remains in the tanks about 30 minutes, when both sedimentation tanks are in service and the plant is operating under normal conditions. It is drawn from them by pipes near the top, and flows by gravity through a supply-main laid down between the two rows of tanks, and connected to the lower part of each filter-tank. The filter-tanks are 14 ft. 6 in. in diameter and 22 ft. 6 in. high in the clear. The lower 14 feet of each of them affords an additional sedimentation capacity; the filter-beds being in the upper part of the tanks, and separated from the lower part by a timber platform covered by a thin reinforced concrete floor.

The filter-bed of each tank has a total depth of 3 ft. 9 in., including the filtering material, under-drainage system, and the pipes for the compressed air and water used in washing the bed. The under-drainage system consists of a manifold varying from 4 to 6 inches in diameter, laid diametrically in the bottom of the bed, with $2\frac{1}{2}$-inch wrought-iron pipes on 12-inch centres connected to it at right angles. These connections extend nearly to the circumference of the tank, and are reduced in size at different points until they are 1 inch in diameter at the ends. This grid-iron system of pipes is embedded in a layer of concrete directly over the reinforced concrete floor; and brass strainers, which extend about 4 inches above the concrete, are screwed into the smaller pipes connected with the manifold. The strainers are placed to cover the bottom of the bed uniformly, and are surrounded with a 4-inch layer of gravel, which has an effective size of 6 mm. A $4\frac{1}{2}$-inch layer of gravel, with an effective size of 3·6 mm., is laid over the coarse gravel; and over it is 30 inches of sand, having an effective size of 0·43 mm. The pipes conveying the compressed air are in the upper layer of gravel; a vertical air line connecting the air-distribution system of each tank with a main air-supply pipe from a compressor in the station. The water from the portion of the tank below the filter enters the bed through open troughs, which distribute its flow and prevent any scouring of the sand. The water passes down through the filtering material into the collecting system and manifold, and then through an automatic controller on the effluent pipe to a clear-water tank. The rate of filtering is governed by an automatic controller; and the loss of head in the filter-beds is indicated by a gauge on a standard beside each tank—the float actuating the gauge pointer being in a vertical pipe connected with the effluent-pipe.

The alum used as a coagulant is made into solution in two tanks in the filter building, and introduced into the suction of the pump in the station through a 1-inch lead pipe leading from the tanks. Soda is mixed in two tanks over an office and laboratory room at the same end of the building as the alum-tanks.

The filters are washed by reversing the flow of water through them, and agitating the sand-bed with compressed air. The head lost in the bed is allowed to reach from 2 ft. 6 in. to 8 feet, depending on the amount of sediment in the raw water, before a filter is washed. The valve standards are all on the same operating platform. The valve on the influent connection is first closed, and the water above the bed drawn down until it is about 3 inches deep over the sand, when the effluent valve is closed, and compressed air, under about 5 lbs. pressure at the tanks, is turned on. The air is allowed to pass through the sand for three minutes before the wash-water is admitted; the continued operation of the plant having determined that this amount of agitation secures the best results on the average. The valve on the wash-water supply-pipe is opened after the required amount of air has been applied. This pipe in each tank is connected with the manifold of the collecting system in the bottom of the tank, and the wash-water enters through the strainers. The wash-water is supplied through a 10-inch main, laid the length of the building between the rows of tanks, by a 6-inch Lawrence centrifugal pump in the filter building, which has its suction connected to the main conveying the filtered water.

The general design of the smaller plant is practically the same as that of the larger; and both plants are operated in as nearly the same manner as a few differences in local conditions will permit. The pond at the former plant is connected by a 48-inch pipe from the intake to an open brick suction well, built in connection with a brick pumping-station building. The raw water is drawn from this well, and elevated to the filter building, which is adjacent to the pump-house, by an 8-inch Lawrence centrifugal pump. The plant has two sedimentation and six filter tanks, placed in the same way as, and of corresponding size to, those in the larger plant, with the same arrangement of pipe connections throughout.

The operation of both plants is under the immediate direction of a chemist and bacteriologist. Daily examinations are made of the chemical quality and the number of bacteria in the raw and filtered water, and the results of these and of the entire mechanical operation of both plants are carefully recorded. Three filter attendants are required to work each plant—one for each eight-hour shift, and an extra mechanic is employed, who divides his time between the two pumping-stations. The average cost of filtering a million gallons of water during six months by the larger plant was as follows: Chemicals and supplies, $1·72; labour, $2·53; interest and sinking fund, $2·21—total, $6·46. The corresponding costs at the station with the smaller plant during the same time were: Chemicals and supplies, $1·67; labour, $4·35; interest and sinking fund, $2·89—total, $8·91. The increased cost for labour at the latter plant is due to the fact that the same amount is required in the operation of both plants, though one has a capacity of 5 million, and the other of only 3 million, gallons per 24 hours.

Mr. Joseph Timmins, of Wigan, has just been installed W.M. of the Holmes Lodge, No. 2706, by the retiring Master, W. Bro. Harry Milligan. A large and very distinguished company of Masons of the Province assembled to witness the ceremony.

Lord Grimthorpe (better known to many of our readers as Sir Edmund Beckett), whose death was announced in the "JOURNAL" for the 2nd of May last, left personal estate of the value of £1,562,500. In addition, he was the owner of about 3400 acres of real estate. The will, which has 24 codicils, is the subject of a law-action now pending.

THE RESERVOIR CATASTROPHE IN MADRID.

In the "JOURNAL" for the 9th of May, reference was made to a shocking fatality which had occurred a few weeks previously in Madrid, through the collapse of the roof of a reservoir, which was constructed of reinforced concrete. The extent of the catastrophe may be gauged by the fact that 30 people were killed, and twice this number sustained more or less serious injury. In a recent issue of "Engineering Record," Mr. T. A. Greenhill, Assoc. M.Inst. C.E., a resident in the city, gave a technical account, with illustrations, of the project and the accident, and we extract therefrom the following particulars.

Madrid is supplied with water by a gravitation system from the Villar collecting reservoir about 90 kilometres (54 miles) away; the water being conducted to the city partly by the river course and partly by a covered aqueduct. The latter started from the Ponton de Oliva dam, which was the first constructed, but which failed to retain the water, as it was built on cavernous limestone. The Villar collecting dam was consequently built farther up the stream, as well as two smaller regulating dams a little above the Ponton de Oliva. The water runs down the bed of the river from the Villar to the upper of the two small dams, and thence by tunnel and covered aqueduct to the Ponton de Oliva and on to Madrid.

The first service reservoir constructed could contain 58,000 cubic metres, or 12¾ million gallons, of water. This became too small for the increased consumption, and a second, of 182,000 cubic metres (say, 40 million gallons) capacity, was constructed. At present the water supply of Madrid is dependent upon this reservoir alone; the first having given way. When it rains, a fine red clay is washed into the channel bringing the water from the Villar dam, where it runs along the river bed. The water reaches the city the colour of chocolate; and as there are no filters, nor even the head necessary for them, it has to be supplied in that state to the consumers, until by settlement it gradually clears, which seldom happens.

For these reasons the necessity of a larger service reservoir was recognized for many years; and, after a long discussion, the construction of a third was commenced. It is to contain about 480,000 cubic metres, or nearly 106 million gallons, of water, in four compartments of about 690 ft. by 280 ft. each, with 22 feet depth of water. The excavation for the basin was completed in 1897, and the construction of the brickwork has been carried on ever since. The method of covering was under consideration for a long time, and at last it was decided that reinforced concrete should be adopted; and in 1901 projects and tenders were invited. In response, at the end of 1902 a number were sent in, varying in cost from 4,600,000 down to 1,562,845 pesetas. After considerable discussion, the last and cheapest was accepted; and a contract was entered into to complete the work in twelve months.

Speaking generally, the design is of ferro-concrete columns 9¾ in. square and 27 ft. 6 in. high to the springing of the arches, spaced 20 ft. by 13 ft. apart from centre to centre. The concrete was made with portland cement, with vertical iron rods of 0·6 inch diameter embedded, tied together at intervals with wire. The columns are supported on bases of reinforced concrete; and the four rods simply rest on two flat bars embedded in the concrete base. These columns are constructed by pouring the concrete into moulds of the full height and punned with rammers having handles of the necessary lengths. The covering consists of parabolic segmental arches of ferro-concrete, 19 feet span and 22 in. rise; the thickness being 2 inches, resting on these columns.

Parallel with the arches the columns are connected, below the springing, by ferro-concrete beams 20 inches deep, with a bar 1½ inches in diameter embedded in position to act as tension member, and three bars at the upper part, 0·6 inch in diameter, in the place of the compression member. These upper and lower bars are connected by vertical and diagonal rods. Beyond this there is no tie in either direction between the tall, slender columns, which are in no way attached at the foot to the floor of the reservoir. Embedded in the thickness of the arches is a network composed of rods ½ inch in diameter tied with wire.

The portland cement used was manufactured in Spain, and was specified to resist in tension 30 kilos. per square centimetre after seven days and 35 kilos. per square centimetre after 28 days—equivalent to 426·7 lbs. and 497·8 lbs. per square inch respectively. The briquette of neat cement is of the size and shape fixed by the French Commission for the Unification of Tests, with a breaking area of about 0·744 square inch. The cement complied fully with the foregoing tests. For the columns and arches the concrete was composed of a mixture of 400 kilos. (802 lbs.) to a cubic metre (27 bushels) of sand, which, for the remainder of the work, was reduced to 300 kilos., or 661 lbs.

On the day of the catastrophe, the covering of No. 4 compartment was practically finished; nothing was done to No. 3, and about one-half of each of the two remaining compartments (Nos. 2 and 1) was covered. It was the covering of No. 4 that collapsed. It appears that, as a test, the cover for a width of about 13 feet transversely, to butt across all the arches, had been loaded with a thickness of about 32 inches of sand, which, however, had been removed. The next day a general collapse took place, which, from the position of the fallen columns, appears to have commenced by the fourteenth row of arches from one side rising at the crown, and the columns on each side falling inward. Only a foreman was on the ground, and he was at some distance from the spot. The gangers and labourers, besides being taken by surprise, were not capable of making any observations of value, which the clouds of dust, in any case, would have rendered difficult. The first impulse, after the general *sauve qui peut*, was to extract the wounded and the dead. One explanation of the collapse advanced is that with the official test load, now considered far too heavy, some arch or arches sank at the crown and the adjoining ones rose; thus allowing the columns between them to deviate from the perpendicular. When this had occurred, the whole collapsed like a pack of cards. In support of this explanation, there were many of the columns after the accident showing a sufficient deviation from the straight to allow the vertical pressure to fall outside the base. The ends of the arches over the sloped ends of the compartment which did not come entirely to the ground were some of them quite flat, while others were pointed like the ridge of a roof. There were even some similar cases on the floor of the compartment.

Without advancing any argument upon the causes which may have contributed to the catastrophe, Mr. Greenhill says attention may be called to the foregoing remarks as well as to the following points: (1) The excessive height of the columns as compared with their dimensions. (2) The absence of any attachment to the floor of the reservoir. (3) No increase in their dimensions at the foot, similar to a tree. (4) The complete absence of any tie in either direction, except the beams at the springing of the arches, in the shape of open lattice work, horizontal or diagonal ties, or the complete filling in, as abutment piers, of a certain number of the spaces between the columns. (5) The effects of temperature on the work. The stability depended upon every part maintaining perfect rigidity, vertically and horizontally, without the slightest deviation; for as soon as any movement took place in any single member, others were able to deviate in their turn, bringing on a general collapse. The quality of the work appears to have been excellent in every respect; so that the cause of failure must be sought for in the design. In the official reports on the tenders, the fallacy of the theories on which the calculation of the stability of ferro-concrete structures are based was pointed out, and the necessity of previous trials of one or more of the systems being carried out before final adjudication was insisted upon. This advice was not followed.

Since the foregoing was written, a fresh development has presented itself, which throws considerable light upon the question. It was stated at the commencement of the article that about one-half of each of compartments Nos. 1 and 2 was covered, the arches having been commenced at opposite sides, and were to meet over the division wall. The whole of the columns and the beams were, of course, completed. The construction had been commenced in March, 1904, and the collapse of the covering of No. 4 compartment took place on the 8th of April last. During the latter part of the month of May, the beams of compartments Nos. 1 and 2, where the arches had not been completed, so that they were exposed to the direct rays of the sun, and were not tied in place by the arches, commenced to dilate to such an extent that on the 2nd of June, on visiting the work, the visible portion of them had become serpentine in plan—in some cases extending over the whole length exposed, and in others confined to four or five spaces between the columns. In the later cases the deviation from a straight line was as much as 20 or 25 inches, judging from the dimensions of the columns, for it was absolutely prohibited to enter the compartment and approach the part of the work thus showing signs of failure. The heads of the columns remained, of course, attached to the beams, so that the columns were to a corresponding extent drawn out of the perpendicular. As the beams are constructed continuously over the two compartments, they have a total length of 585 feet. Two days after Mr. Greenhill had written the above, the deformation of the beams brought down some 200 of the columns in the first compartment.

Accompanying his article was a diagram which showed the highest and lowest temperatures every day since the works of the cover were commenced; and it plainly indicates the rise at the commencement of April, when the first collapse took place, and at the beginning of June, when the second one occurred. It would therefore appear clearly demonstrated that the cause of the failure proceeded almost entirely from expansion of the reinforced concrete caused by elevation of temperature, for which no allowance had been made in preparing the design.

Mr. J. W. Watkinson, the Chairman of the Farnworth and Kearsley Gas Company, left estate of the gross value of £7136.

Special tar macadam has been laid on a street of 6 in 100 grade in Ottawa, in order to furnish a good footing for horses. The roadway is 30 feet in width, and contains two street railway tracks laid on a concrete foundation 18 feet wide and 6 inches in thickness. Sandstone blocks are placed along the rails. The macadam was laid by first placing a foundation of 2-inch limestone brought up to within 4 inches of the finished surface. On top of this a 3-inch course of 2-inch tarred limestone was laid and consolidated with a hand roller, and then a 1-inch wearing coat of ⅝-inch tarred limestone was similarly placed and rolled. The surface was then dusted with fine limestone, and given a final rolling. There is only a slight crown, as the pavement is on a heavy grade.

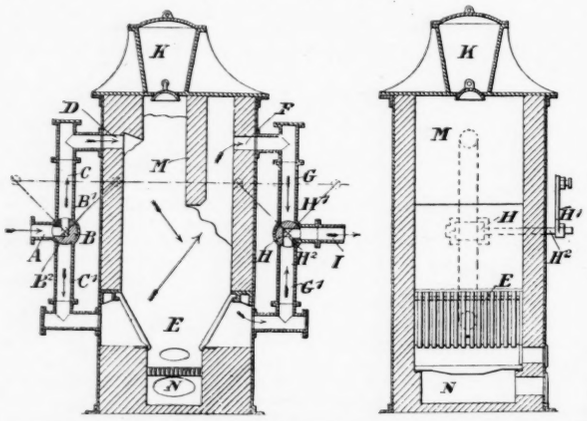
REGISTER OF PATENTS.

Gas-Producers.—Cerasoli, A., of West Kensington Mansions, W. No. 19,827; Sept. 14, 1904.

This invention relates to a gas-producer which will generate from bituminous fuel "a combustible gas free (or practically free) from tarry matters and condensible gases," and capable of being utilized in gas engines without further treatment.

The producer is constructed with air-inlets at the top and bottom of one side and gas-outlets at the top and bottom of the opposite side; and these passages are controlled by suitably linked valves in such manner that the top air and bottom gas-passages are open simultaneously, while the bottom air and top gas passages are closed, and conversely.

The air supply-pipe A is put in communication, by a valve B, with either of a pair of branches C C^1 leading respectively to an air-port D in the furnace wall at or near the general level of the fresh fuel, and to the underside of the fire-grate E. On the opposite side of the furnace,



a gas-port F, at or about the same level as the air-port D, and the underside of the fire-grate E, are respectively connected with the branches G G^1, which, by means of the valve H, can be alternately connected with the gas outlet-pipe I. The valves B H are coupled with each other, as indicated, by linking the levers B^1 H^1, which are secured on the valve rocking shafts B^2 H^2 respectively, and are simultaneously operated to direct the blast either downwardly through the fuel from the branch C to the branch G^1, or upwardly from the branch C^1 to the branch G.

The fuel is fed to the furnace through a closed hopper K; a hanging wall M separating the fresh fuel from the gas-port F. This hanging wall extends downwardly to an extent which compels the whole or most of the condensible gases and tarry matter to pass through a hot zone of fuel when the air blast is in the direction from the fire-grate upwards towards the port F. When the blast is in this direction, the partially burned fuel in the central region is completely consumed, and the main mass of fuel in the lower part of the furnace is raised to a high temperature, whereby, when the valves B H are reversed, and the blast is directed from the port D downwardly to the fire-grate E, the carbon of the tarry matter is consumed, and the condensible gases are converted into fixed gases on their passage through the hot zone of fuel at and above the level of the fire-grate.

Fluid Meters, Motors, and Pumps.—Sharp, J., of Glasgow. No. 20,058; Sept. 17, 1904.

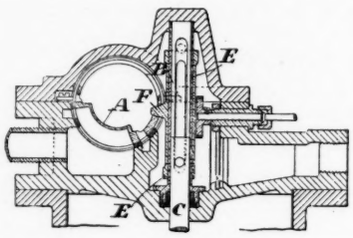
The patentee proposes to use a main water-measuring cylinder with double-acting piston, and a small auxiliary cylinder placed at right angles to it, with a double-acting piston (or it might be two small auxiliary cylinders with single-acting pistons coupled together) and to control the action of the fluid in these cylinders by a single valve, and transmit the measuring motion of the meter to a train of index-gearing.

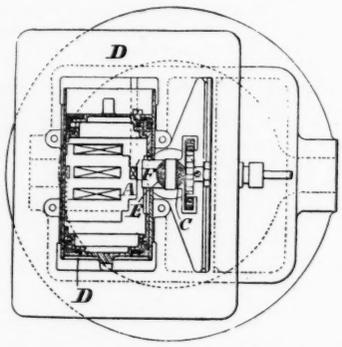
As applied to a meter (as shown) the valve A is located in a water-supply chest or casing B, and consists of a piston or cylindrical valve having combined oscillating and reciprocating movements. The part of the piston valve in which the ports are formed is preferably fitted in as a separate piece or valve, so that it may always lie flat on its face. It is oscillated to-and-fro by motion received from the reciprocating movements of the main piston-rod C. The valve face has port connections communicating to opposite ends of the auxiliary cylinder D, so as to supply fluid pressure to one end and exhaust from the opposite end alternately.

The piston-valve A forms the central part of the piston of the auxiliary cylinder; and by its movements the piston gives a reciprocating to-and-fro movement to the valve which controls the inlet and exhaust from the main cylinder.

The auxiliary cylinder D is cast in one piece with the valve face; and the valve-actuating piston is formed with a hollow central space open to the inlet water pressure, which therefore acts on the inner faces of the auxiliary piston and produces equilibrium. The actuating fluid is admitted to opposite ends of the cylinders alternately by oscillating movements of the valve.

The distributing valve is actuated from the reciprocating movement of the main piston-rod by mounting a moveable sleeve E on the end of the piston-rod of the main cylinder, and forming the sleeve with a slot, the ends of which engage with a projecting pin secured to the main piston-rod, and by which the sleeve receives movements to give the piston-valve alternate oscillations. The movements of the sleeve are intermittent, and transmit an oscillating motion to the cylindrical piston-valve by means of a projection F on the sleeve working in a corresponding slot formed in the piston-valve.





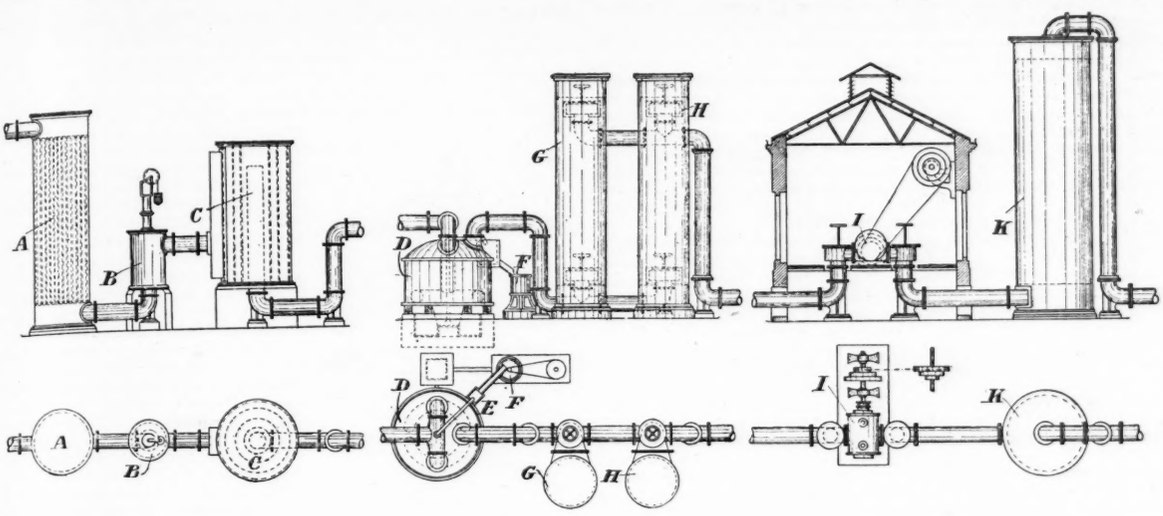
After describing several modifications of this arrangement (the chief of which are illustrated in the specification), the patentee remarks: In applying these improvements as a motor—such as an organ blower—the ported connections would be taken from the water-valve box to opposite ends of the main cylinder and the movements be simply the same as in the meter, except that the piston-rod of the main cylinder is continued through the stuffing-box in the top cover to which the necessary connecting rods to the bellows would be attached. In applying the improvements in connection with pumps, the main or motive power and auxiliary cylinders would be fitted and controlled by a single valve (the same as in the meter), and the piston-rod of the main cylinder is continued through the stuffing-box in the top cover as in the foregoing; and this piston-rod would be extended sufficiently to receive the pump-piston or plunger, so that the main pump and motive-power cylinders are arranged in tandem, and are therefore direct-acting. The fluid for working the motive-power cylinders in every case may be either water, steam, air, or gas. The piston-rod which connects both the motive-power and pump pistons would be fitted with a crosshead or radial link in suitable position lengthwise, and stops would be formed on the valve-rod of the motive-power cylinder against which the crosshead would act at each to-and-fro reciprocating movement in order to give the requisite motion to the main distributing valve and rod of the power cylinders.

Obtaining Bye-Products in the Dry Distillation or Gasification of Fuel.—Koppers, H., of Essen-Ruhr, Germany. No. 20,870; Sept. 28, 1904.

Hitherto the gases obtained from the dry distillation or gasification of coal have (the patentee remarks) been treated, generally speaking, in accordance with two methods, for the purpose of separating the bye-products, tar, and ammonia. In accordance with the first process, the gases were first cooled down to atmospheric temperature—thus condensing the tar and gas water; the ammonia remaining in the gas being washed out by means of water or acid. This treatment yielded a pure tar; but it was necessary to convert the liquid containing the ammonia into a marketable product requiring steam or the re-introduction of heat and so forth. The other method of obtaining the bye-products consists in either not cooling the gases at all, or only to a very small extent, and then treating them with acid lyes or acids. This process gives impure products; the tar is partially decomposed; and the ammonium sulphate is not obtained free from tar. Both systems present the important defect that the two principal constituents—tar and ammonia—must undergo common processes which are only directed to obtaining one of the substances and which have prejudicial effects as regards the other.

The object of this invention, therefore, is to obtain the tar and ammonia "in a more simple and economical manner" by separating each product at the temperature best adapted for it; the separation of the tar being effected before the ammonia is obtained.

The process is said to be based upon observations and experiments which have been undertaken. As is known, tar is a mixture of organic bodies of various natures, and of such a composition that approximately 95 to 97 per cent. of the constituents boil above 100° Celsius. Now experiments have demonstrated that gases of dry distillation—such as coke-oven and retort gas—may be cooled far below 100° Celsius without water condensing. The dew-point for retort gas is 72° Celsius, and that of coke-oven gas 85° Celsius—barometer at 760 millimetres. The difference arises from the higher percentage of water in the coke-oven gas, as coking coal, in contradistinction to gas coal, is treated with a certain amount of water—say, 14 per cent. Further experiments have shown that the tarry constituent in the gas may be separated at temperatures between 75° and 100° Celsius. By the treatment of the raw gas at temperatures which lie slightly above



the dew-point for the separation of water or at that point, the tar is separated into one part, about 95 per cent. of the whole, which boils above 100° Celsius and which may consequently be condensed and separated mechanically pure, and into a smaller portion which remains in the gas in the form of vapour. The gas freed from tar which is thus obtained presents "very great similarity" to the gases evolved in distilling ammoniacal liquor, and may therefore be treated directly for ammonium sulphate in exactly the same way as these latter. It contains organic constituents and gases dissolved, which enter the acid with the steam. For the purpose of obtaining the sulphate directly, the gas is conducted into sulphuric acid, or into a bath with acid sulphate lye, which (with the object of obviating any condensation from the gas) is kept at an appropriate temperature. Condensation of the water carried in the form of vapour is prevented owing to the fact that the temperature of the gas is maintained above the dew-point, which has been previously ascertained, so that vaporization is able to take place even in the acid bath. After separation of the ammonia, the gases leave the saturation chambers and are cooled to atmospheric temperature, when the water vapour becomes deposited for the first time—this condensate being a soft, pure water, which can be made use of. In this process the gases themselves do not suffer in their composition in any way; so that they may be treated to form benzol, illuminating gas, and so forth, as usual.

Now, in order that the residuum of organic bodies referred to, and which has not separated in the cooling of the steam to the dew-point, may not be destroyed in the sulphuric acid, weak acid lyes of as far as possible constant strength are employed for saturation, which constancy is ensured owing to the fact that acid is supplied continuously as required, and the salt separated is likewise withdrawn continuously. This bath, which (in the manner explained) is only able to attain a predetermined degree of concentration, does not attack the tar, especially the more readily boiling parts. The residuum of organic constituents, therefore, passes through the process unaltered; is separated with the water; and is added to the tar which was separated earlier. Any already thickened tar which has entered the saturation bath may be removed from it by any suitable mechanical device—such as a pump, injector, or the like.

The gas, as it comes from the coke-oven, gas-retort, or regenerator, contains ammonia partially bound with acids. This part of the ammonia is separated as a thin saline solution with the tar and some water before passing through the saturation apparatus. It may be dealt with in numerous ways. Thus, for example, it might first of all be treated like gas liquor for obtaining ammonia. Another way would be to pump back the saline solution for the time being into the collecting main until it is sufficiently concentrated to flow into the saturation vessels. The gases have such a high temperature in the collecting main on the ovens that the excess heat may advantageously be employed for re-vaporizing the condensed water which is produced on the way to the saturation apparatus.

In many cases—in accordance with the kind and quantity of the condensate—the enriching of the distillation gases which leave the oven or collecting main, and which is necessitated by this direct transmission of heat with water vapour, may not appear to be advantageous, as by this means the temperature of complete saturation is raised, and with it the temperature at which the separation of the tar has to take place. In such a case, it is advisable to treat the condensate in such a manner that a relative increase of steam in the gas is avoided. For example, the collecting main might be provided with a second jacket; the condensate being temporarily stored in the intermediate space. The vapour obtained in this manner, or by similar indirect heating, is conducted into the gas-main in front of the saturating chamber without being passed through the tar-separator; and here the raising of the dew-point is without importance.

As already explained, it is necessary for the purpose of efficient tar separation to cool the gas to a temperature at which the saturation with steam is complete. At normal atmospheric pressure, this is from 70° to 85° Celsius. But, in order to obviate the uncertainty which arises in keeping to these temperatures, the procedure may be as follows: The temperature of the raw gas is lowered as much as is necessary for an efficient tar separation, without, however, departing too much from the dew-point for water saturation. After the separation has taken place, the temperature of the gas is again raised to such an extent as to permit of ammonium sulphate being directly produced from the saline solution with the highest efficiency, and excluding as far as possible any condensation during the saturation process. As in this process for separating the tar the gases may be cooled (while obviating the uncertainty already referred to) down to, or even below, the dew-point, it is also possible to again raise the temperature for the saturation process to such an extent that not only does condensation not occur but that even vaporization takes place. To this end—having regard to the great difference of temperature present—the hot gases coming from the ovens may themselves be used as the source of heat, or heating gas, heat radiating from the walls of the ovens, waste gases, or the like, may be employed. The modification described above is especially applicable to the introduction of the process in the case of existing plant, where the gases have hitherto been largely cooled (15° Celsius) and, after the separation of the tar, submitted to the usual scrubbing processes. Omitting this scrubbing, the gases, immediately they have been freed from tar, are raised to a temperature of (say) 85° Celsius by the heat of the raw gases, or to such a temperature as is best adapted for the direct formation of ammonium sulphate in accordance with the principles of this invention. In a manner exactly analagous to the process described, they are then conducted into the saturation bath and thereupon cooled to atmospheric temperature. The condensate which is formed at the first cooling is preferably converted into ammonia separately.

The process for obtaining the bye-products with direct production of sulphate, after the separation of the tar has taken place, which forms the basis of this invention, is characterized broadly by the fact that the systematic separation of these products is effected at the temperatures most suitable therefor respectively, whereby a temporary transition of temperature, for the purpose of separating the tar, down to, or even below, the dew-point for the time being for water saturation, may be counterbalanced by a subsequent supply of heat. In doing this, an essential feature is the bringing through the process of the residuum of organic bodies which has not been separated, while avoiding decomposition by the employment of constant saturation in the bath—the regulated supply of fresh acid preventing the attack of organic bodies. Equally important is the subsequent treatment of the saline solution which has been referred to, and which takes place by the separation of the ammonia bound with acids, in one or other of the manners explained.

In practice, the process permits of obtaining the bye-products almost "cost free," as the heat inherent in the gases, which has hitherto been turned to no account, is sufficient for the direct separation of the solid marketable ammonium salt. What has heretofore been a "necessary evil" in obtaining ammonia—namely, the separate introduction of quantities of fresh water with the unnecessary consumption of heat and the formation of a large amount of waste water—is wholly obviated, as only the condensation water, which for other reasons must be vaporized from the coal, goes through the process, without necessitating a special supply of heat. "This condensation water is, however, obtained pure, and is a perfectly soft water which can be made use of."

By way of example, the patentee illustrates an installation for carrying the process into practice by mounting in series single apparatus. The raw gases coming from the collecting main first of all enter the cooler A, where they are cooled to about the dew-point for water saturation. That portion of the tar which condenses at about 100° Celsius then condenses. For separating the condensed tar, which floats as a vapour in the gas, this latter is passed through a tar-separator B and then through the filter C. The latter is a vertical cylinder with internal concentric perforated annular jackets (three for example), which serve for the reception of the filtering material. The gas enters the outer annular chamber, and filters first through a coarse layer of coke, and then through a fine layer. The tar separated in the filter, and also any water that there may be, flow to the bottom; and the contents of the filter may be drawn off below. The gas freed from tar in this manner passes to the saturation apparatus D. This is preferably a closed vessel, provided with a lead lining, and partially filled with acid lye of the salt to be obtained. A recess or cavity in the middle of the bottom serves for the reception of the salt formed. Through the cover of the saturation apparatus, two pipes descend to the bottom of the vessel, where they are bent into semi-circular parts very finely perforated for the discharge of the gas. An injector E raises the salt which has collected at the bottom directly into the centrifugal drier F. The issuing lye flows back automatically into the saturation apparatus. The fresh acid is supplied continuously in regulated quantities, so that the bath does not exceed a predetermined degree of concentration, and

so that (as already explained) the residuum of organic bodies still accompanying the gas is not decomposed.

An appropriate mechanical device is provided for the removal of any already condensed tar constituents which may have reached the acid bath. This residuum of organic bodies reaches the cookers G and H with the gas, and here vigorous cooling takes place. The condensate consists of pure water with small quantities of organic substances which separate from the water and which may be conducted to the other products of condensation that were previously separated in a warm state. The water itself is a perfectly soft used water. Tar and ammonia are then obtained; and the gas may be conducted by the sucker 1 into the benzol scrubber K in the usual manner—further treatment there taking place in the usual way.

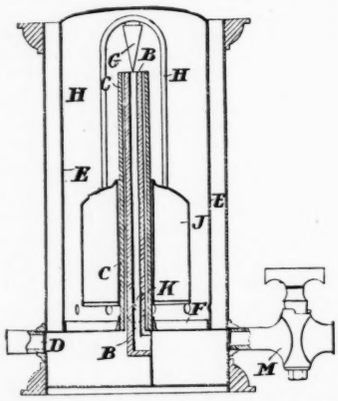
In the modification of the process which has been described, and in which the raw gas (for the purpose of effecting the most efficient separation of the tar) is cooled down to, or even below, the dew-point, and then for the purpose of directly obtaining ammonium sulphate again raised to a higher temperature so as to avoid condensation, the apparatus is modified to the extent of arranging two coolers in front of the tar-separator. In the cooler through which the raw gases first of all pass, the gas already freed from tar is employed as the cooling medium; the main purpose of this being to raise its own temperature before it reaches the saturation apparatus. The cooler, therefore, constitutes a heating apparatus as regards this gas. The second cooler is supplied with cooling water in the usual manner, and serves to bring the raw gases down to the dew-point for water saturation or even below it. The remainder of the installation may be arranged in the same order.

An appliance particularly adapted for the separation of the tar in the present case, where the gases are freed from tar before the steam is separated, is the following: Finely perforated sheets of metal (say 1 millimetre bore), upon which tar, heavy oils, or similar liquid bodies stand to a suitable height, are arranged in such a manner that the gas, cooled to about 70° to 80° Celsius, is obliged to pass through them either by means of suction or pressure, the tar clouds or vapours are thereby dissolved by the tar, so that the condensate at the same time serves as washing medium.

Pressure-Reducing Devices for Gas.—Anderson, J., and Bennett, J. H., of Edinburgh. No. 24,197; Nov. 8, 1904.

This invention relates to a device for reducing the pressure of gas passing through a supply-pipe to a lamp or other service, comprising a vessel within which are vertical gas supply and delivery pipes over which is a bell, provided with a liquid seal; the opening of the supply-pipe being controlled by a valve connected to a body partially immersed in the liquid forming the seal. There are means for raising or lowering the level of the liquid in the vessel, whereby the valve may be lifted or lowered to a greater or less extent; and the difference between the pressure of the supply and the delivery of the gas may be readily controlled.

As shown, there is a circular vessel, from the centre of the bottom of which a vertical gas supply-pipe B rises nearly to the top; and concentrically around the pipe is a delivery pipe C, which conveys the gas at reduced pressure to the lamps through the conduit D. Over the supply and delivery pipes is a bell E, which fits over a concentric ring F on the bottom of the vessel. Small holes in the bottom of the bell provide passage-ways for the water of the seal. The top of the pipe B is provided with a valve G (preferably of long conical form, as shown), which is connected by arms H with a float partially immersed in the water forming the liquid seal. The vessel is open at the top to the atmosphere, and is provided with a small cock-controlled outlet K at the bottom for the withdrawal of water.

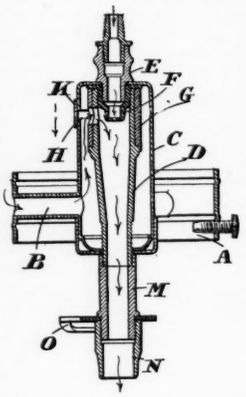


In operating the device, the bell E is fixed in position in the water seal; and the gas supply is turned on at a cock M. If the height of water in the bell is such that the weight of the float J exceeds the total pressure tending to raise the valve, no gas, of course, passes to the outlet-pipe B. But, by raising the level of the water, the float is also raised, carrying with it the conical gas-valve G, and thus opening the gas supply for the interior of the bell. As soon as the pressure of gas in the bell tends to become excessive, it causes the level of the water within the bell to fall below that of the water outside it; and in consequence the float is lowered and the gas throttled until the proper reduced pressure is obtained again.

The action is said to be practically instantaneous. It is found that the pressure of the gas in the outlet-pipe may thus be reduced to any desired amount below that in the supply-pipe; and the reduced pressure does not vary in spite of fluctuations in the gas-main, unless the water-level within the bell be raised by pouring in more water, or lowered by drawing off some, when the reduction in pressure will be less or greater respectively.

Burners for Obtaining Light and Heat.—Bower, G., of St. Neots. No. 25,841; Nov. 28, 1904.

This invention relates to burners of the bunsen class, and more particularly to those of the inverted type, whether used for lighting or heating purposes. It has for its object "the thorough mixing of gas or vapour with air to prevent the formation of carbon, and to prevent the mixing-tube from getting so hot as to induce firing-back."



The burner is constructed of a ring A to which are attached the outer ends of radial tubes B, the inner ends of which are coupled to a chamber C, constituting the air-chamber of the burner, and within which is arranged the bunsen tube D. This tube is supported at its upper end by a short tube E passing through the upper closed end of the air-chamber and provided with an ordinary adapter to connect it to the gas supply-pipe. The bunsen tube is fitted with an injector nozzle F, and is formed with one or more air-inlet openings, over which works a regulating sleeve G formed with corresponding openings, and coupled by a pin H passing through a slot in the air-chamber into a sleeve K mounted to turn on the air-chamber and fitted with an operating handle. The lower end of the bunsen tube has secured to it an extension tube M adapted to hold in position caps closing the lower end of the air-chamber and fitted at its lower end with a nozzle N and mantle support O.

In the event of an inverted mantle giving way, and another not being obtainable, an ordinary mantle may be used by turning the burner upwards and placing on the open end of the mixing-tube a mantle of the requisite size for the gas; while, if neither kind of mantle can be obtained, then by closing the open ends of the cross tubes so as to prevent air entering into the air-chamber, and by closing the sleeve over the holes in the mixing-tube, an ordinary fish-tail, batswing, or other burner may be inserted into the tube and light obtained.

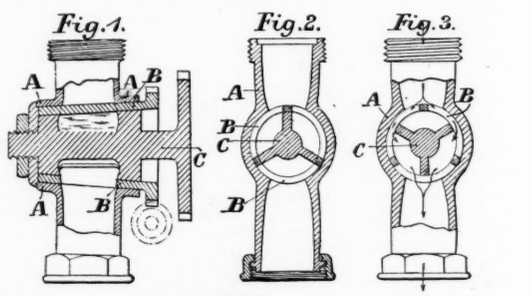
Incandescent Gas-Mantles.—Thorn, A., of East Ham. No. 25,844; Nov. 28, 1904.

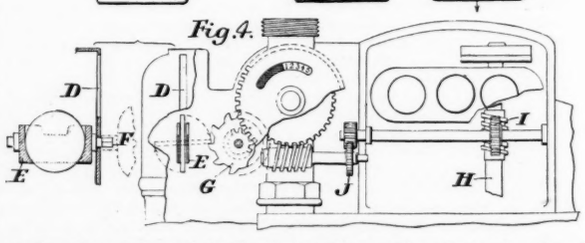
The patentee proposes to render an incandescent mantle incombustible at the bottom end by dipping it for half-an-inch or less in a solution of alum and soda, "thus forming a band or ring of its own material unburnt by the process of burning off the finished mantle." The band will hang below the flame. To this unburnt portion of the mantle the ends of a long loop of asbestos cord are attached; the top of the loop reaching through inside to the top of the mantle where it rests on the fork.

Cock for Prepayment Gas-Meters.—Dupoy, J. R., of Paris. No. 26,266; Dec. 2, 1904.

This invention (particularly applicable for controlling the delivery of gas in connection with prepayment gas-meters) is essentially characterized by the fact that it comprises two concentric plugs having passages so disposed that one of the plugs, when operated by mechanism on the introduction of a coin, permits gas to flow into the meter, while the other, which is controlled by the mechanism for registering the quantity of gas consumed, serves to cut off the supply of gas immediately the volume consumed corresponds to the number of coins inserted.

Fig. 1 represents a longitudinal section of the cock. Fig. 2 is a transverse section, showing the cock in its closed position. Fig. 3 is a





similar view of the cock in the open position. Fig. 4 is an elevation of the mechanism for controlling the cock applied to a meter.

The cock comprises a shell A and two concentric plugs B C. The plug B is tubular, and is provided with three apertures, each having exactly the same area and separated one from the other by three solid

parts disposed at 120°. The plug is also provided with a toothed ring, to which movement is transmitted as hereafter described. The plug C which rotates within the plug B, has a solid core, and is provided with three apertures entirely separated from each other by partitions disposed at 120°, so as to exactly correspond with the solid parts of the plug B; the plug C being also provided with a toothed wheel actuated by the insertion of a coin as hereafter described. The cock is mounted upon the gas supply-pipe of the meter, as shown in fig. 4.

The coin introduced into the meter at the slit D is received, as in ordinary prepayment meters, by a coin-holder E mounted on pivots and capable of being operated by a key F. By turning the key, the edge of the coin is caused to engage with one of the teeth of a wheel G, which carries a pinion in gear with the toothed wheel of the plug C. The toothed wheel of the plug B receives motion from the mechanism for registering the consumption of gas by the following means: The shaft H of the registering mechanism carries a worm, which gears with a worm wheel I keyed on an intermediate shaft and which transmits motion by means of wheels, the ratio of the gearing of which would vary according to the price of the gas.

The action of the apparatus (assuming the cock to be in the closed position, fig. 2) would be as follows: A coin (a penny, for example) having been introduced, the key F is turned so as to cause the coin to act upon the toothed wheel G, and thus impart an angular movement to the plug C. The coin, after having completed a revolution, falls into a closed receptacle in the casing. This operation may be repeated several times, in order to obtain enough gas for distribution; the maximum angular movement which can be imparted to the plug C (and which should be less than 120°) being limited by a stop. At each introduction of a coin, the plug C is caused to turn to a certain extent; and it finally occupies (for example) the position represented in fig. 3, the degree of opening of the plug corresponding to the quantity of gas to be supplied in exchange for the money paid in.

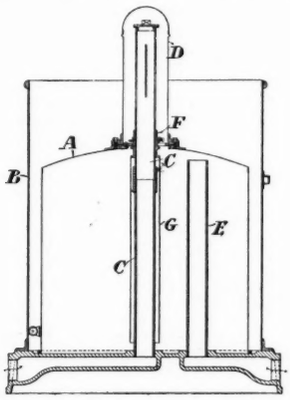
Immediately the consumption of gas commences, the shaft H of the registering mechanism imparts an angular movement to the toothed wheel, and consequently to the plug B, which, in rotating in the same direction as that previously imparted to plug C, gradually closes the passage of the gas until the moment when the solid parts of the two plugs come opposite to one another—that is to say, when the cock is closed (as fig. 2)—thus entirely cutting off the gas.

In order to enable the consumer to ascertain the quantity of gas still unconsumed, the cock may be provided with an indicator for showing at any moment the relative positions of the two plugs, To this end the toothed wheel may be provided with a slotted opening through which may be exhibited a scale on the face of the wheel, as seen on fig. 4.

Anti-Fluctuating Gas Supply Apparatus.—Keith, J. & G., and Collinson, A., of Farringdon Avenue, E.C. No. 4121; Feb. 28, 1905.

This invention relates to apparatus for maintaining the supply of gas to gas-engines, or the like, at practically constant pressure.

As shown, the usual gasholder or bell A is placed within an outer water vessel B and guided (to rise and fall) upon a central gas inlet-pipe C. This latter, however, extends upwards into a dome D on the top of the holder, while the usual open-ended standpipe E within the



holder serves as the outlet to the engine. The gas inlet-pipe is closed at its upper end, but has, near its upper end, side slits or outlet openings adapted to be more or less covered by a sleeve F, fitted to slide freely on the inlet-pipe and having attached at its lower end a dipping tube G, whose lower end is under the water level in the holder.

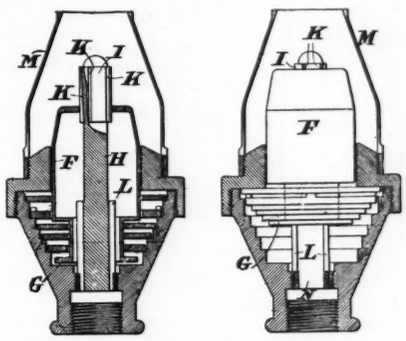
In operation, the holder A rises under the increase of gas pressure, and the sleeve F acts in the usual way as a valve by more or less covering the slits of the inlet-pipe C, "so that a practically uniform pressure is maintained by the valve openings being regulated according to the pull of the engine."

Air and Gas Regulators for Incandescent Lamps.—Schuppisser, H., of Zurich, Switzerland. No. 7213; April 5, 1905. Date claimed under International Convention, April 14, 1904.

Gas consumption regulators, the patentee points out, in which the gas supply to the burner is regulated by a bell valve introduced into she mixing-tube, and which is adjustable relatively to a valve-cone, to that the width of the opening is varied in proportion to fluctuations of pressure of the gas present, are known. But in them, regulation of the gas consumption only takes place, and not regulation of the air supply to the mixing-tube. According to the present invention, the bell valve is guided upon a valve-pin, and is so arranged that it simultaneously regulates the amount of air supplied to the mixing-tube, so that an approximately constant mixing ratio is maintained between the amount of gas and air supplied to the mixing-tube by the bell valve arranged to work in a conically widening mixing-tube.

Central vertical sections are given through the regulator, with portions in elevation—in the right-hand view, the parts are shown as displaced by the gas pressure.

The regulator is arranged in a funnel-shaped casing; and steps are turned in the wall of the funnel upon which rest weights, formed as disc rings. The lower portion of a vertically movable bell F extends through the rings; while the upper portion of the bell extends closely through a head or cap screwed on to the casing. At its lower end the bell has a flange G, which is located below the lowest weight. H indicates a



regulating pin carried by the casing and extending centrally through the bell; its upper end being formed with a cylindrical head I that closely fits the central opening in the top of the bell, through which it extends. The head I, which acts as a guide to the upper part of the bell, has formed round its periphery five equally distributed vertical gas-outlet grooves K, each increasing in depth downwardly. Ribs L at the lower part of the pin form gas-passages N between them, and also serve to guide the lower part of the bell. Upon the head or cap is arranged a mixing-tube M, the central axis of which coincides with the central axis of the bell F, and which, at its lower part, has a conical form corresponding to the upper part of the bell. The inclination of the conical portion of the mixing-tube is similarly directed, but at a different angle to the inclination of the conical upper part of the bell. The operation of the regulator is as follows: Gas flows through the passages N into the bell F, and through the five outlet openings surrounding the head I and formed by the grooves K and the opening provided for the passage of the regulating pin-head I in the top of the bell, into the mixing-tube M, for the purpose of being there mixed with a suitable quantity of air. The weight of the bell corresponds at this time to a determined pressure—say, 20 m.m. water column—below which the gas pressure is not sufficient to lift the bell, or below which the bell remains in the position shown in the left-hand sketch. If, now, the pressure increases—say, from 20 m.m. to 30 m.m. water column—the bell will be lifted until, by its flange G, it lifts the first weight. The bell will then be weighted by a certain amount, and it is thereby able to exert counter-pressure to the gas pressure corresponding to 30 m.m. water column and remain in its raised position.

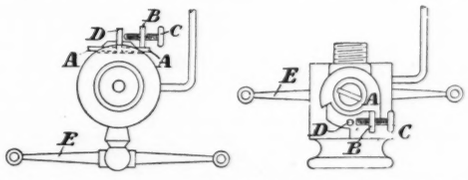
The lifting of the bell has caused it to move upon the head I, whereby the five gas-outlet openings K have become smaller, because the grooves decrease in depth towards the top. If the gas pressure still increases, the bell rises still more; all the weights being ultimately raised one after the other. With the rise of the bell, the cross section of the five gas-outlet openings K decreases more and more. The grooves in the head are arranged in such a manner that the product of the outflow speed of the gas and the cross section of the outlet openings formed by the grooves and the bell is constant in any position of the bell.

For the production of a uniform flame, correct regulation of the air supply to the mixing-tube is also necessary. This regulation of the air supply is effected by making the upper part of the bell project into the conically formed lower part of the mixing-tube, so that as the bell rises it decreases more and more the annular space between it and the mixing-tube; and by this means the speed of the air drawn in increases with the increased gas pressure. When the gas pressure falls, the bell sinks and unloads itself gradually from the weights by depositing them upon the steps.

Gas-Cocks.—Weickart, T. H. W., of Leipzig. No. 10,362; May 17, 1905.

This invention relates more particularly to a device for controlling the gas supply according to the intensity of the flame.

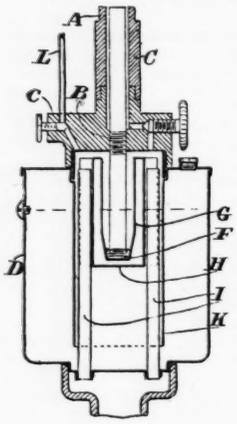
The cock is provided with an abutment disc A, and its casing with an abutment D (hitherto known devices). The improvement consists in that the disc is provided with a projection or flange B disposed rectangularly to the disc, and through which passes the controlling screw



C. By turning the screw, the quantity of gas to be supplied can be exactly determined, as the screw, when abutting against D, opens the cock more or less. The abutment disc A is preferably disposed at the opposite side to the lever E; but it can also be placed at the same side, in which case the abutment disc may be directly connected to the lever E.

Automatically Lighting Gas-Lamps.—Kissel, W., of Königswusterhausen, Germany. No. 14,923; July 20, 1905.

This apparatus for automatically lighting and extinguishing gas-lamps by the variation of the pressure in the gas-mains, consists of a float and a mercury seal carried by it and used for opening and shutting off the gas supply to the main burner—a pilot jet being used for igniting the flame of the latter. In such apparatus as hitherto known, the seal has, the patentee states, to be adjusted according to the locality; and the adjustment has been affected by varying the immersion of the float by weighting it more or less. "The adjustment of the seal to the correct depth of dip in this manner, however, is troublesome and difficult, as for altering the load on the float the whole apparatus has to be taken to pieces and put together again." The object of this invention is to obviate this difficulty, and is attained by so arranging the gas-pipe of the burner dipping into the mercury (the dip pipe) that it can be adjusted from the outside of the float chamber, instead of adjusting the immersion of the float.



The dip-pipe A, supplying the main burner, is provided with a screw thread B and screwed into a tapped hole of the cover C. An intermediate socket E is pushed upon the boss of the cover and carries the burner-head. To adjust the mercury seal, it is only necessary to remove the socket E, ignite the gas issuing from the pipe A, and then turn the projecting part of the pipe until its bottom end dips into the mercury in the cup F and the flame becomes extinguished. The float differs from the usual construction by the mercury cup not being arranged on its top, but near to the bottom H of the float; the cover of the float being formed with a deep depression. By this arrangement, the centre of gravity of the float is in its lower part, so that the pipes I supplying the gas to the float chamber K can be made use of to guide the float. This is said to have the further advantage that a float of the largest possible section can be placed into the chamber K; while when the float is not guided on the gas-pipes, it has to be reduced in diameter. When by the dipping of the pipe A into the mercury the flame becomes extinguished, the seal and float are correctly adjusted for the lower day pressure. After the socket E has been replaced, and the burner-head and mantle have been put on, the pilot jet L is ignited and adjusted. As soon as the pressure is increased at the central station (by, say, a quarter-of an-inch), the water in the float chamber is depressed by the pressure of the gas entering into the float chamber K through the pipes I, and the float sinks. The orifice of the pipe A is thereby uncovered, and the gas can pass to the burner, where it is ignited by the pilot jet. When the pressure is decreased, the float rises again and shuts off the supply of gas to the burner.

Prepayment Gas-Meters.—Clarke, C. A., of Dalston, and Rossiter, W., of Clerkenwell, E.C. No. 14,690; July 17, 1905.

This invention relates to the class of gas-meters in which a nut and screw are turned relatively to each other in one direction on the introduction of coins and in the other direction as the gas is consumed. The screw is thus moved lengthwise on the introduction of a coin, and causes a spring pawl to engage the wheel and clutch it to the hand wheel until, on the rotation of the wheels, the pawl is thrown out of engagement by a stop whose position can be altered according to the price of gas.

An illustration is given at the foot of the page of such a meter in side elevation, plan, and section.

A is the screw which is rotated from the meter in the usual way (say) by means of a worm and worm wheel not shown. The screw works in a nut B turning in bearings in the casing C and having on it a ratchet-wheel D with which engages a pawl E pivoted to a plate F fast with the hand-wheel G, which is co-axial with the screw A and turns in bearings in the fixed plate. The pawl E has upon it a lug, which projects through a slot in the plate F, and has a flat cut upon it with which engages the nose of a tumbler H, which is pivoted to the plate F and is constantly pulled by the spring shown—thus normally holding the pawl E out of engagement with the wheel D, so that, though the hand-wheel may be turned at any time, the mechanism is not affected but, when a coin I is inserted through the slot, rests between the axle of the wheel G and the lug, so that if the hand-wheel be now turned anti-clockwise, the coin comes against a fixed stop, and the continued movement of the hand-wheel causes the lug to ride up over the coin, and free the flat from the nose of the tumbler and throw the pawl E into engagement with the wheel D. The coin being now unsupported falls into the casing. The tumbler then turns on its pivot under the influence of the spring, its nose passing beneath the lug and preventing any movement of the pawl. The wheel D is therefore now clutched to the hand-wheel and turns with it, causing the screw A to move out of the nut—*i.e.*, away from the hand-wheel. This continues until a pin on the tumbler, which protrudes through a slot in the plate F, comes against a stop K, and causes the tumbler to turn on its pivot, so that its nose passes from beneath the lug. This allows the pawl E to to be turned on its pivot, by the pressure of a fixed stop on the lug, sufficiently to allow the nose to engage the flat, and so hold the pawl out of engagement.

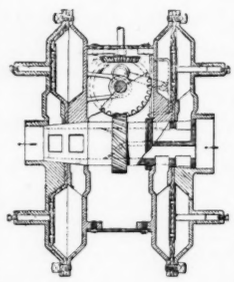
The stop also lies in the path of a lug on the plate F and prevents any further movement of the hand-wheel, which is now turned back to bring the parts into position to receive another coin. The stops may be carried by an arm L, which pivots on the axle of the hand-wheel and can be adjusted according to the price of gas—being clamped in any desired position by means of a screw which enters any one of a series of holes in the plate. M is a detent pulled downwards by a spring, and preventing any movement of the wheel D in the wrong direction.

The screw A has upon it two arms. The one N projects into a long slot in a lever arm O fast on a rock shaft, which passes into a chamber P, from which the gas travels to the meter and which is fitted with a cover. In this chamber is a pivoted valve, which is normally held off the orifice Q, opening into the inlet-pipe by a spring (not shown), but closed by an arm on the shaft. As soon, therefore, as a coin has been inserted into the meter and the hand-wheel turned, the screw A moves out of its nut B and moves the arm away from the valve, which is opened by its spring so as to allow gas to pass into the meter. The passage of the gas through the meter, however, revolves the screw, which therefore moves into its nut again and gradually closes the valve and cuts off the supply of gas. The second arm R on the screw carries a rack, which gears with a pinion S on a spindle, which passes to the outside of the meter and carries an index moving over a dial and registering the quantity of gas paid for and not used at any time.

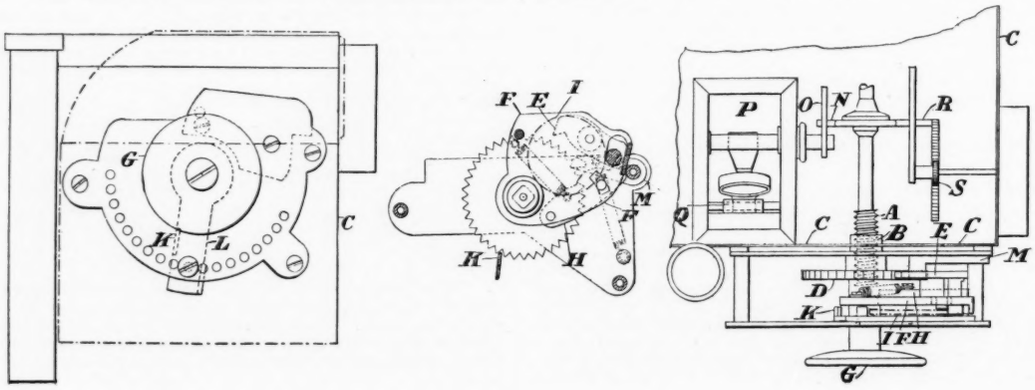
Liquid Meters.—Hagspiel, W., of Ludwigsburg, Germany. No. 8554; April 20, 1905.

This meter has a diaphragm actuated by the liquid to be measured; the movements of the diaphragm being transmitted by a piston-rod in the usual manner to the shaft by which the counting apparatus is actuated.

Liquid meters in which the diaphragm acts as the piston have, the patentee mentions, heretofore usually been provided with two diaphragms, the action of which is similar to that of the two pistons of a double-acting pump. In the present invention these diaphragms (hitherto always of circular shape) are formed by annular plates, the outer and inner edges of which are attached to the sides of correspondingly shaped annular casings. By adopting this form of construction a hollow space is created in the centre of the cases containing the diaphragm, which is best employed for harbouring the distributing mechanism. Moreover, "the supply and discharge of the liquid to be measured takes place in the axial direction, and the frictional resistance offered to the liquid is at the same time very considerably diminished, and the whole mechanism is simplified, with the result that the liquid meter can be fitted without any difficulties whatever."



The piston diaphragms themselves may (as shown) be in the form of a circular or elliptic ring, or of rings having any desired shape; and the hollow spaces in the interior of these rings are arranged either concentrically or eccentrically. Consequently, the reversing gear or the distributing mechanism may be arranged either concentrically or eccentrically in the interior of the rings. The distributing mechanism consists of a tubular rotary valve with axially arranged inlets and outlets for the liquid. The interior of the tubular valve is divided into two halves by a partition which simultaneously covers half of each end of the valve, and is twisted through a right angle, so that the inlets and outlets for the liquid of one half of the distributing mechanism in relation to those of the other half, and the two ends of the partition in relation to each other, are disposed at an angle of 90°.



As it is not possible to make the diaphragms so accurate as to insure that the amount of liquid flowing through the cylinder or the apparatus at each revolution of the shaft shall always be the same, and represent a previously determined quantity, and as, moreover, even a small inaccuracy in the action of the diaphragms must result in making the amount of the liquid actually passing through the apparatus much larger than the quantity indicated by the counting mechanism (especially when the apparatus has been in use for a considerable time), the apparatus is provided with a device for regulating the amount of the liquid coming through, by means of which the stroke of the piston diaphragm can be so adjusted as to allow only a fixed quantity of liquid to pass through the apparatus at each revolution of the main shaft.

APPLICATIONS FOR LETTERS PATENT.

17,678A.—MACFARLANE, J., "Gas-stove." Oct. 13.
20,355.—ASCH, M., and SILBERSTEIN, I., "Suspending mantles." Oct. 9.
20,445.—WESSELSKY, L., "Gas-generators." Oct. 10.
20,473.—LAKE, H. H., "Illuminating apparatus." A communication from H. H. Sylvester and P. E. Collins. Oct. 10.
20,474.—NEGAL, M., "Incandescent fittings." Oct. 10.
20,475.—JOYNER, C., AND CO., LTD., and INCHLEY, E., "Gas-fittings." Oct. 10.
20,538.—ATKINSON, J. W., "Gas-fittings." Oct. 11.
20,543.—FREILING, K., "Gas-cooker." Oct. 11.
20,582 —CHATAIGNIER, E., "Gas-burners." Oct. 11.
20,628.—MILNE, J., "Gas-brackets." Oct. 12.
20,630.—DEMPSTER, R., "Gas-valves." Oct. 12.
20,658.—JARDOT, A. G., PIKE, E. B., and ENGLAND, J. W., "Four-cylinder combustion engine." Oct. 12.
20,738.—MORTON, T. C., "Incandescent burners." Oct. 13.
20,757.—HOFFMANN, C. F. P. E. E. DE, "Gas-conduits." Oct. 13.
20,783.—BICKERTON, H. N., BRADLEY, H. W., and CLERK, D., "Gas-producers." Oct. 13.
20,799.—GADDUM, C. E. W., PEARCE, H. A., and WILLIAMS, H. D., "Unions for meters." Oct. 14.
20,826.—DARRAH, H. M., and GIBSON, T., "Incandescent gas-fittings." Oct. 14.
20,837.—GROSSMANN, J., "Manufacturing sulphate of ammonia." Oct. 14.
20,841.—SELLARS, J. C., "Gas-conduits." Oct. 14.
20,873.—WOODALL, H. W., and DUCKHAM, A. M. D., "Gas-stoves." Oct. 14.

A Missing Gas Collector.

A collector of the name of George Bevan, in the employ of the Swansea Gaslight Company, has been missing since the 2nd inst.; and it is reported that an investigation of his accounts has revealed the fact that he has defrauded the Company of sums collected from the consumers amounting to about £200. It appears that he asked for leave of absence for a week; and as he did not return, and nothing had been heard of him by his wife, his accounts were looked into by the Company. The result of the inquiry was to show that he had apparently, by a most elaborate system of fraud, altered the receipts given to the consumers, which do not correspond with the counterfoils handed in to the office. The alterations have extended between the periods of two quarter-days—June 30 and Sept. 30; and they were bound to be found out within the two dates named. Bevan appears to have dealt chiefly with the arrears, having collected these amounts from the consumers; and by altering his demand notes and counterfoils in various ways, he did not account for the payments made to him, but gave receipts to the consumers for the amounts due up to the quarter-day. It is stated that a warrant will be applied for, and he will be arrested, as soon as his whereabouts can be ascertained. Bevan had been in the employ of the Company for many years, and confidence was reposed in him. It may be mentioned that the Company are fully insured against loss in the Provident Clerks' Insurance Company.

Curious Position of the Portsmouth Board of Guardians.

The report of the Sub-Finance Committee submitted at the last meeting of the Portsmouth Board of Guardians stated that the Overseers had not paid any contribution to the Board for the present half year; whereas the sum of £9000 should have been handed over. It was recommended that a letter should be sent to the Overseers calling attention to the fact that, unless the contribution was paid, the Board would have no money to meet the accounts of tradesmen and others. In explanation of this awkward position, the Chairman (Mr. W. J. Groves) said there was an appeal by the Water Company against their assessment, which had been increased after being valued by an expert. The Company were advised to appeal under the Act of 1854, which would not stultify the Overseers' work in collecting the rate, while at the same time they would get all justice done. The Company, however, went under the 1862 Act; and this stopped the collection of the entire rate. Though this was pointed out, yet in the face of it the Company decided to go on with their appeal. After a decision had been arrived at, the rate would be collected. The work of collecting had been stultified by the Company. One member thought the matter should be reported to the Local Government Board, in order that some amendment of "the stupid old Act," whereby an individual could stop the whole machinery of the borough, might be introduced; and this was agreed to. Another member said he was surprised that a powerful and rich Company, who had increased their revenue enormously without any rise in expenditure, should place the Board in such an invidious position. Public notice should be taken of the matter, and the blame put upon the right shoulders.

LEGAL INTELLIGENCE.

LAMBETH COUNTY COURT.—Tuesday, Oct. 17.

(*Before His Honour Judge* EMDEN.)

Vogan and Others v. South Metropolitan Gas Company.—Disputed Meter Registration.

This was an action brought to recover £71 3s. 5d., the balance of a sum of £87 8s. 5d. overpaid to the defendants, owing, as was alleged, to the meters on the plaintiffs' premises at Mill Wharf, Dockhead, registering incorrectly. The case came before his Honour on the 19th ult., as reported in the "JOURNAL" the following Tuesday, on a question of the relevancy of certain interrogatories which the plaintiffs wished to put to the defendants, and which were decided to be merely "fishing" inquiries.

Mr. E. P. HEWITT (instructed by Messrs. Wansey, Bowen, and Co.), appeared for the plaintiffs; Mr. ATHERLEY JONES, K.C. (instructed by Messrs. Hicklin, Washington, and Pasmore), represented the defendants.

Mr. HEWITT, in opening the case, stated that the meters in question were a 200-light, put in in November, 1898, a 150-light put in in September, 1901, and a 20-light, also installed in 1901. These meters were tested by the London County Council, at the request of the plaintiffs, in February and March last, and were certified to register too fast—the first some 5·13 per cent.; the second, 6·10 per cent.; and the third, 7·53 per cent. The defendants had made an allowance for overcharge for the Christmas quarter; but the plaintiffs contended that they had been overpaying for a long time prior to this. As far as he could make out, the Company's defence was based on two grounds—first, that there was a clause in the conditions printed on the card attached to the meter that no allowance could be made for gas registration except for the current quarter; and, secondly, that there was a clause meeting the case in the Company's Act passed last session.

Mr. ATHERLEY JONES: An Act is not retrospective unless it is specifically mentioned.

Mr. HEWITT said from this observation he presumed that the second ground of defence was withdrawn. The plaintiffs had been much hampered by certain interrogatories not having been allowed.

Judge EMDEN: I see now that, though the majority of them were inadmissible, I should have allowed a few, especially in regard to what was done by the Company with the meters after they were tested by the London County Council's officials, and what were the results of the Company's examination of them.

Mr. ATHERLEY JONES undertook to give all the information his Honour thought was essential.

The following witnesses were then called:

Mr. *R. Vogan* said he was the only active partner in the plaintiff firm. Before having the meters tested, he endeavoured to get a temporary supply of gas from the Company; but, owing to difficulties being put in the way, he obtained new meters from Messrs. Glover, and sent those which had been in use to the London County Council's testing-station. At the place where the meters were fixed (granaries) the temperature was regular; his experience being that it was cool in summer and warm in winter.

Cross-examined: He had never seen a card hanging to the meters in question; but he knew, as a matter of fact, it was usual to attach such a card. He had never examined the card himself, nor, so far as he knew, had his employees. The custom was, when the gas bill came in, for the clerk or foreman to check the amount by the meter, and work out the figures to ascertain if it was correct. He had never intended to convey that the increase in his gas bills was wholly due to defective meters, as the consumption of gas on the premises varied with the conditions of his trade.

Judge EMDEN (to Mr. Hewitt): How do you propose to show the exact amount overpaid?

Mr. HEWITT: That is impossible. I ask your Honour to decide, sitting as a jury, what are the probabilities, and find accordingly.

Mr. *R. Arthur*, the officer in charge of the London County Council meter-testing station, proved the certificates of defect put in. He said that after being tested the meters were taken away by the Gas Company. Subsequently the smaller one was brought back, and on a second test it gave a similar result to the first. He had had 34 years' experience in testing gas-meters; but he and those associated with him in the work were not supposed to know anything about the interior mechanism. He was not a meter maker, and therefore did not care to offer an opinion as to the cause of the defects or the length of time they were in existence.

Mr. HEWITT: Tell me, as an expert, when a gas-meter registers too fast, is it not generally the fault of the leathers not expanding sufficiently?

Witness: Probably it is.

What is the reason why some meters register too fast and others keep practically always right?—It may, perhaps, be the warmth of the place where they are.

Is it not a difference in the leathers?—That is a matter for the makers to say.

When meters become fast through the hardening of the leather, is it not the case that this hardening takes place within twelve months after they have been put up?—I could not tell you within twelve months—there is no given time for such things.

In cross-examination, witness said he believed that of the meters suspected of defects during the present year 501 registered too fast, 171 too slow, and 317 correctly. In addition to the foregoing, 640 meters had stopped altogether; so that the total against the gas companies was greater than that in their favour. He could not, however, say for certain, without the registers.

Mr. ATHERLEY JONES: Is it also not a fact that the percentage is higher in slow than in fast meters, thus: Inaccurate, 5 to 10 per cent.,

175 fast, 65 slow; inaccurate, 20 to 25 per cent., 1 per cent. fast, 17 per cent. slow; inaccurate 25 to 31 per cent., none fast, 16 slow?

Witness: I should not like to make any statement without the register.

In re-examination, witness said the consumers and the gas companies brought the meters to be tested.

Mr. *R. Wood* stated he had been in the service of the London County Council for the last ten years, and understood the mechanism of gas-meters so far as the registration was concerned; but he could not say, even approximately, when a meter registered too fast by reason of the leathers contracting, as in the present case, how soon after it was put up this fast registration would begin. Asked whether, as a rule, when the leathers went wrong in the way mentioned, the original state of the leather had anything to do with it, he replied that the meter might be in a warm place.

Mr. HEWITT: Supposing the leathers contract when the meter is in a place of normal temperature, is that a sign that the leather was of bad or indifferent quality?

Witness: That is none of my business. I am a tester, and not a maker of gas-meters.

In order to resist any tendency to contract, must the leathers be dressed in the proper oil for the purpose?—I take it that the manufacturers use the proper oil, which I believe, is almond oil.

In further examination, witness said the results of the first testing, on March 10, and the second, on July 12, of the 20-light meter were the same. It was impossible for him to say, from his experience, that the three meters in question only went wrong after Michaelmas last year.

Mr. *John Lancefield* (who explained that he attended on subpœna) said he had had 35 years' experience of gas-meters. Where a meter went fast through the leathers contracting, it would, as a rule, come to a stationary point and not contract any further.

Mr. HEWITT: Seeing that one of these meters was certified in March to register 7·53 per cent. too fast and four months later was tested with an exactly similar result, and that it had been up for four years, when, in your judgment, had the "stationary point" been reached?

Witness: That is impossible to say.

Would the meter, in your opinion, have begun to register fast prior to the previous Michaelmas?—I should think it gradually got fast to a certain point, and then remained stationary; but that does not mean that it went fast during the whole four years.

In reply to further questions, witness stated that he thought it very likely the meter was fast before Michaelmas.

Judge EMDEN: Would it probably, in your opinion, have been found fast if tested six months previously?

Witness: Yes.

Examination continued: His answer applied to any meter fixed in a similar sort of place, and therefore included the two other meters in dispute.

Mr. HEWITT: In order that the leathers in meters should not contract, they should be dressed very carefully in almond oil and soaked for several months?

Witness: They should be soaked for certain periods in almond oil and plumbago.

If they are good leathers and carefully dressed, will they last for many years without contracting?—Oh, yes; for thirty or forty years.

As all these meters were comparatively recent ones, the reasonable inference is, I suppose, that the leather was not good or well dressed in any of the cases?—You cannot say that. A meter might be out of use for a time, and the leather might become hardened and stiff.

But that did not happen in this case. If after a short period, as here, you find meters going substantially fast, I suppose the inference is that the leather was not of good high-class quality? I ask for your opinion on the foregoing facts, and remembering that the temperature is normal?—Under the circumstances, I should expect to find the meters registering correctly. If they did not, owing to contraction of the leathers, there must have been something wrong with them.

How long probably would the contraction have been going on?—That is a question I could not answer, because in certain meters, made by the same manufacturer, some may go wrong in a month or so, and some may go right for 20 years. It is a difficult question indeed.

Would you or would you not consider two years a reasonable limit within which the leathers had contracted as these did?—No; I should not like to say that. It might have been much more recent.

It would not come on all at once?—No; the contraction comes on very gradually, and then remains stationary.

You believe there was a gradual contraction in this case?—Yes; I should take it to be a gradual contraction. But, of course, it may not be.

Do you consider it reasonable to assume that these meters went fast only during the previous Michaelmas quarter—that is, within four or five months of the time they were tested?—It is impossible for me to answer that question.

Judge EMDEN: He says there must have been a gradual contraction.

Witness: Yes; that is so—a gradual contraction.

In cross-examination, witness said it was quite impossible to tell how quickly or how slowly, or with what intervals of rest, the leathers of the meters in question might have shrunk. The shrinkage would go on gradually—it would not come on all at once; but whether or not it commenced within six months he could not tell.

Mr. HEWITT (in re-examination): My friend speaks of a shrinking leather having "intervals of rest." I ask you, if a meter is in use continuously in the same house or place of work, is it a probable thing for it to go fast for a year, then to go without alteration for a time, and afterwards to go fast again?

Witness: No.

This closed the plaintiffs' case; and the further hearing was adjourned.

A Question of Liability for Pollution.

Considerable interest was evinced in a case heard at the Coventry County Court a few days ago, before his Honour Judge Ingham. It was an action brought by William Wakefield against the Coventry Corporation; damages amounting to £50 being claimed for river pollution. It was alleged that the defendants, or persons in their employ, on or before May 28 last, passed sulphate of ammonia or other injurious matter into the river. The matter was stated to have escaped from the new gas-works at Foleshill, and, getting into the river which ran through plaintiff's land, caused injury to his cattle, &c. His Honour said that all the Jury had to do was to assess the damages. These they fixed at £41 13s. The question of liability between the Corporation and Mr. Dorse, the Contractor, was then proceeded with. His Honour, after hearing evidence, said that a pipe was broken during the course of the Corporation's work. They put the poisonous matter on the land; but this caused no damage to the plaintiff in the case. What caused the damage was the escape from the land to the river. Was the escape due to what the Corporation did, or was it occasioned by the acts or omissions of the Contractor or arising in the execution of the works? Obviously it escaped during the execution of the work. Judgment would therefore be given against the Contractor.

Cutting Off a Tenant's Gas Supply.

At the Shoreditch County Court, last Tuesday, before his Honour Judge Smyly, K.C., William Behrman, of 265, Mare Street, Hackney, claimed damages from Adolp Weinreb, who carries on business as a tobacconist in the same house, for depriving him of a supply of gas. Plaintiff and defendant took their gas from the same pipe, but through separate meters; and one night last August the former was aroused by the noise of the latter knocking in the room over his head. In the morning he could not obtain a supply of gas for his stove; and, on making inquiries, he was told by the defendant that he had smelt gas, and had cut off the supply to prevent trouble or accident arising. Plaintiff complained of this action, and sent for a gas-fitter to restore the connection. On his arrival, however, the defendant refused to allow him to enter the room. Thereupon plaintiff sent for a representative of the Gaslight and Coke Company, who censured the defendant for acting as he had done. Admission to the room being still persistently refused, plaintiff had a special connection made to give him a supply. In answer to his Honour, defendant explained that he detected a very strong smell of gas; and, feeling sure it came from the plaintiff's room, he cut the connection. Asked why he did not allow the plaintiff to have the damage repaired, he said he considered he was too careless in his way of using the gas. Plaintiff said it was a question of spite. His Honour said that if a person thought there was danger, he was justified in severing a connection; but defendant's proceeding was unreasonable. He awarded plaintiff 20s. and costs.

The Street Lighting of Liverpool.

Mr. Richard Dart, the Chairman of the Liverpool Electric Power and Lighting Committee, in replying to a vote of thanks for his services during the past municipal year, stated that in the twelve months the equivalent number of 16-candle power lamps connected to the electric supply mains had increased from 277,767 to 310,562, and the number of consumers from 5345 to 5821. The amount of electrical energy supplied for lighting and power showed an increase of about 6 per cent. During the year ended Sept. 30 last, 4½ miles of new streets had been lighted by means of 113 single incandescent gas-lamps. Building operations in the suburbs continued to proceed actively; and this increase was likely to be maintained. A re-arrangement and improvement of the lighting in 4½ miles of old streets had been carried out during the year, involving the erection of 31 new lamps and the removal of 150 old ones to fresh positions. As the general scheme of passage lighting approved by the Council was completed in 1904, the work in this direction had been limited to the erection of 94 lamps, principally in new passages, and on the application of the police. The daily testing made of the gas indicated an average illuminating power for the year of 20·8 candles, against the parliamentary standard of 20 candles. The city was at present lighted by means of 18,455 lamps.

The Price of Gas to Manufacturers in Birmingham.

The question of the price of gas to manufacturers in Birmingham has been referred to a Special Sub-Committee of the Finance Committee, who are going fully into the matter; and there is an idea abroad that a reduction in price from 1s. 10d. to 1s. 6d. per 1000 cubic feet will be recommended. Mr. J. J. B. Arter, in a further letter to the Press, urges that this reduced price should, as in other towns, include gas for manufacturing purposes—such as enamelling and brazing, as this consumption would form part of the day-load of the gas plant. Smethwick, as will be seen from a paragraph appearing elsewhere, has decided to reduce the price to 1s. 6d. to manufacturers; while at Oldbury the charge for this purpose has for a long time been 1s. 7d. net, and at West Bromwich gas for power can be had at prices ranging from 2s. to 1s. 5d. per 1000 cubic feet. Referring at an election meeting to the question as it affects Birmingham, Alderman Bishop said the Gas Committee had studied all the new methods of gas reduction as they came out; but what they had to do was not so much to render service to the manufacturing classes at the expense of other classes, as to conduct the gas-works on lines which produced a profit and helped the ratepayers. He did not think the price could be reduced, except perhaps for power purposes, and even for that almost certainly not to 1s. 6d. per 1000 cubic feet.

Cheaper Gas for Power at Smethwick.—The Smethwick Gas Committee, after having given careful consideration to the question of the price of gas for power purposes, decided that it was necessary to make a reduction. They accordingly recommended to the Town Council that the charge for motive power and manufacturing purposes, other than lighting, should be reduced from 1s. 9d. to 1s. 6d. per 1000 cubic feet, as from the 1st inst. This the Council have agreed to.

MISCELLANEOUS NEWS.

GAS APPARATUS EXHIBITION AT NEWPORT (MON.).

A ten-days' exhibition on the latest lines, promoted by the Newport (Mon.) Gas Company, was opened last Wednesday at the Tredegar Hall. Those responsible for the highly attractive show that has been brought together are Mr. Thomas Canning, the Engineer, and Mr. T. Hazell, the Secretary of the Company, and Mr. W. R. Francis, the Organizing Manager. The exhibits include gas lighting, heating, and cooking and gas-driven machinery in all their latest developments; and there are, of course, cookery demonstrations and competitions, as well as instrumental and vocal music each afternoon and evening.

There was a large attendance at the opening ceremony, which was performed by the Chairman of the Company (Mr. R. Laybourne, J.P., D.L.), who said that the exhibition was held to show the great improvement which had been brought about in gas lighting. The motto of the Company was "Efficiency with economy." The Newport Gas-Works were established in the thirties of the last century, in the early history of gas lighting, when no means existed of measuring the quantity of gas consumed. A charge per burner was made, with a restriction as to the time the gas was used; and if this was exceeded by the consumer, he was charged as if burning the gas the whole night. This irksome and intolerable system was ended by the invention of the gas-meter. A few years ago, a panic was caused among gas proprietors by the advent of electric lighting, many of them selling their shares at a discount. This rivalry was a blessing in disguise; for it stimulated invention, which resulted in a marked improvement in gas lighting. As regarded public lighting, the superiority and economy of gas had been abundantly proved, and electricity had in many towns been superseded by gas.

The interior of the hall is illuminated by Sale-Onslow high-pressure intensified incandescent gas-lamps; the candle power being 27,000. The front of the hall, on the exterior, is lighted by one 1000-candle power and four 600-candle power Welsbach self-intensifying incandescent gas-lamps, two 700-candle power Lucas self-intensifying incandescent gas-lamps; and one 3000-candle power Sale-Onslow high-pressure intensified incandescent gas-lamp on the tower. The latter is the most powerful single light ever exhibited in the district. The total illuminating power of the exterior lighting is equal to 8800 candles. There is also a sign which constantly changes colour, by means of a device driven by the gas which illuminates it. In the entrance hall, which is lighted by inverted incandescent burners totalling 1500-candle power, are samples of various coal-tar products; and another interesting exhibit is a model bathroom, for which Messrs. Ewart and Son are responsible, fitted with geysers supplying hot water to a bath and lavatory basin—the water and the room being heated by gas. There is also a complete kitchen, shown by Messrs. Willey and Co., which is proving a great attraction to visitors; and furnished dining and drawing rooms show the artistic possibilities of gas lighting. One of the most interesting exhibits is that of the Gas Company, in which is to be seen every form of incandescent gas lighting, artistic fittings, shades, pendants, high-power lights, &c. The exhibit also includes a photograph of the single holder used for the supply of gas to Newport in 1836, and a second photograph of one of the holders employed by the Company at the present day. The progress made by gas is shown by the fact that one out of several holders now used by the Company contains more than a thousand times as much gas as the holder which served all Newport in 1836. Gas-engines are also employed in driving dynamos, and in providing power used in connection with the exhibition, thus showing how electricity can be cheaply produced.

Among the exhibitors, we notice the following: Arden Hill and Co.; the Ramie Company, Limited; Willey and Co., Limited; Thomas Glover and Co., Limited; R. & A. Main, Limited; Parkinson and W. & B. Cowan, Limited; William Sugg and Co., Limited; Hutchings' Cookers; Welsbach Incandescent Gaslight Company, Limited; New Inverted Gas-Lamp Company, Limited; Richmond Gas Stove and Meter Company, Limited; George Glover and Co., Limited; George Newton; Sutherland Meter Company, Limited; John Wright and Eagle Range, Limited; Moffat's Limited; Ewart and Son, Limited; E. Perman; The National Gas-Engine Company, Limited; and Crossley Bros., Limited. There is also a very interesting collection of loan exhibits, to which the following have contributed: Bird and Sons (tar products); Stone and Tinson (ammoniacal liquor products); Alexander Wright and Co. (Simmance's two-candle standard pentane lamp, the Orsat Muencke's gas analysis apparatus, &c.); Gas Meter Company (glass-cased dry gas-meters); George Glover and Co. (glass-cased dry gas-meters); George Bray and Co. (incandescent fittings and burners); Graham, Morton, Limited (gravity bucket coal-conveyor and model setting of inclined retorts); J. Ruscoe and Co. (device for attaching branch-pipes to existing gas-mains, without interruption of supply or loss of gas); Mr. J. L. Rust (early type of gas-cooker, made by Leoni about the year 1865); and Mr. Henry Hack (model gas-works).

There is a home-baking competition, open to users of gas cooking-stoves, promoted by Messrs. Brown and Polson, in connection with which three prizes are offered; and cookery competitions for girls of from 10 to 16 years of age, from schools under the control of the Newport Education Committee, to the winners of which valuable prizes will be awarded. Each afternoon and evening there are cookery lectures, with practical demonstrations, by Miss G. Bruce, as well as instruction in the art of bread baking. To-morrow Mr. Canning will deliver a popular lantern lecture on "Gas—how it is made, and how to use it." The performances of the Exhibition Orchestra are of a varied and interesting character.

The exhibition has been a remarkable success in the matter of attendance; it having been visited, at a moderate computation, by from 4000 to 5200 people each day. Due care having been taken beforehand to provide proper exits for the heated air, the very great power of gas as a ventilating agent has been fully demonstrated; the air of the hall being at all times cool, fresh, and pure, in spite of the immense number of lights, fires, and cookers in full operation, and of the large crowds constantly filling the place for the eight hours a day during which the exhibition remains open.

LIGHT RAILWAY CONSTRUCTION AND THE PROTECTION OF GAS-MAINS.

At the Board of Trade, on Wednesday, Sir HERBERT JEKYLL heard the objections of the Newark Gas Company to the confirmation of the Newark and District Light Railway Order, in which it was proposed to make a light railway of 3½ miles in Newark and the district.

Mr. W. BELL, Parliamentary Agent, appeared for the promoters; Mr. SEDGWICK (of Messrs. Rees and Frere, Parliamentary Agents) represented the Gas Company.

Mr. SEDGWICK said the Company desired a new clause to protect their plant, in the following terms: "If it be proved that any injury or damage to any gas-pipes or other metallic pipes, structures, or substances, of the Newark Gas Company shall have resulted from fusion or electrolytic action caused by any currents generated or used for the purpose of electric traction on the railway, nothing in this Order shall relieve the Company from any liability to make compensation for any such injury or damage which would not have existed but for the passing of this Order."

Sir H. JEKYLL said they were aware that clauses of this kind were constantly being asked for by gas companies; but they had never been allowed by the Board, because they believed that the Joint Committee's clause gave sufficient protection. Unless there were exceptional circumstances applicable to Newark, it was not likely that the Board would depart from their usual practice.

Mr. SEDGWICK: I cannot establish anything beyond this, that several Acts of Parliament have been passed with the clause in them; and I can show that Parliament has been more and more inclined to grant the protection.

Sir H. JEKYLL: Well, it is exceedingly unlikely, notwithstanding the precedents, that the Board will insert the clause.

Mr. SEDGWICK said the first precedent was in 1901, when the clause was inserted in the London Tramways Electric Power Act and passed by Lord Camperdown's Committee; and in the next session, in the Sheffield case, Lord Newton's Committee again recognized the justice of the clause, and inserted it. In 1902, the precedents were against this course; but when they came to 1903, Parliament began to change their mind, and the clause was inserted in the Brighton case, as well as in the Somerset and District Electric Power case. In 1904, in the Torquay Tramways case, the Committees of both Houses agreed that the clause ought to go in for the protection of the Gas Company; and it was only owing to the opposition of the then Chairman, Lord Balfour of Burleigh, that it did not remain in the Bill when it received the Royal Assent. Then a still more recent precedent was one of the last session—the Administrative County of London case. The clause was asked for by the Kingston Gas Company and the Metropolitan Water Board, and it was inserted by Lord Camperdown's Committee.

Sir H. JEKYLL remarked that that was not a tramway?

Mr. SEDGWICK acknowledged that it was not; but he said the same principle would apply. In the Administrative County of London case, the new Lord Chairman of the House of Lords and the officials did not take any steps to have the clause struck out. They appeared to think it was just. The Bill went to the Commons with the clause in it; and Sir James Kitson's Committee passed it. If the present promoters were seeking their powers by Bill, the Company would have a decided hope of getting the clause in.

Sir H. JEKYLL: You have quoted several precedents in favour of the clause. Are you aware of a number of cases in which it has been asked for and refused?

Mr. SEDGWICK: Yes, a large number in 1901 and 1902; but not so many were refused in the last two sessions—in fact, there are more precedents for it.

Sir H. JEKYLL: Have you a case in which the Joint Committee's clause has failed to give sufficient protection?

Mr. SEDGWICK: I cannot recall to mind a case at the moment; but I remember in the Brighton Gas Company's case, they produced an engineer who had a pipe damaged by electrolysis. This was also done in the Sheffield case.

Sir H. JEKYLL: Did that come from a case where the regulations were in force?

Mr. SEDGWICK: I do not know.

Mr. BELL said in his experience there were many instances in which such clauses as the one proposed had been put upon him; but these were in 1900 and 1901. In 1903, in the Nottingham and Derbyshire Tramways case—the biggest scheme before Parliament, with seven or eight different local authorities owning gas and water pipes, and gas companies too—they had this clause among their batch of protective clauses, and they were given; but when they came before the Lord Chairman they were struck out. The promoters were inclined to leave it to the Board of Trade, except that he might say that the Gas Company were sufficiently protected by clause 39, which set forth that before they could interfere with any pipes the promoters had to give notice and pay for any damage done. In addition to this, there was the common-law right that for what was done, irrespective of anything in the Order, they could claim damage.

Mr. SEDGWICK said he was afraid he must differ from Mr. Bell on that point. Clause 39 only referred to cases where the promoters required the Company to alter their pipes for the purpose of laying their rails; but when they had altered the pipes, if they were afterwards injured by electrolytic action, the Company had no right under clause 39.

Sir H. JEKYLL: These are stock arguments advanced on these occasions. I will report to the Board what you say; but I cannot hold out the slightest hope that they will allow the suggested clause

to go in. It would create a very awkward precedent, and throw doubt upon the Joint Committee's clause.

Mr. SEDGWICK: We do not wish to say that the Joint Committee's clause is not useful under special circumstances; but it does not go far enough in this case.

Sir H. JEKYLL: There is no evidence to show it.

Mr. SEDGWICK: Well, these wretched promoters have no right except under this Order, and they wish to construct works which will cause us great injury, and we want them, and not us, to pay for it. I hope the Board will change their mind, and carry out what Parliament evidently intends them to do now.

Sir H. JEKYLL said he should reserve the question, and would let the parties know what decision the Board came to.

CROYDON GAS COMPANY AND LOCAL IRONMONGERS.

Agreement as to the Supply of Gas-Stoves.

In the "JOURNAL" for the 22nd of August, we reproduced from the "Ironmonger" the draft heads of the suggested arrangements with local tradesmen which had been under consideration by the Croydon Gas Company and the Central Board of the Ironmongers' Federated Association. The following is the form of agreement as finally approved. Although the agency arrangements are being made primarily with the local members of the Association, the agreement is not necessarily confined to them.

1.—The Contractor will act as the agent of the Company in regard to the supply to the Company's consumers of gas cooking and heating stoves and other apparatus for the use of gas by way of hire, or hire-purchase, or sale, on the terms hereinafter expressed.

2.—Commission at the rates hereinafter provided shall, so long as this agreement remains in force, be payable to the Contractor by the Company on each such transaction, provided that the Contractor is instrumental in effecting the said transaction (whether by arranging terms with the consumer, or by introducing the consumer to the Company for the express purpose of bringing it about directly between the Company and the consumer), provided that the introduction aforesaid be shown to the Company's satisfaction to have been the proximate cause thereof. The Contractor shall be entitled to commission only if, in the opinion of the Company's Engineer or his deputy, such negotiations have taken place between him and the consumer as indicate that the transaction was due to his efforts.

3.—The commission payable in case of letting on hire or hire-purchase terms of any apparatus by the Company shall be a sum equal to, in case of hire, the first quarter's rent; and in case of hire-purchase, one-twelfth of the total price to be paid by the consumer for the apparatus.

4.—The kinds of apparatus which will be let on hire, hire-purchase, or sold, by the Company, and the terms of such hire, hire-purchase, or sale, will be by them determined and notified to the Contractor from time to time, and may be altered without notice.

5.—No commission will become payable unless and until a proper agreement for the transaction has been entered into by the consumer on the Company's terms and to their satisfaction. No commission will be payable in respect of the supply of any apparatus resulting in the displacement of apparatus already installed for the use of gas for a like purpose.

6.—The Company shall not, during the continuance of this agreement, charge to any consumer, for any apparatus sold outright to him and delivered at his premises, a lower net price than will represent to the Company a profit of 15 per cent., calculated on the net cost thereof to the Company at any of their premises or at the consumer's premises as the case may be. The Company shall, however, be at liberty to supply any materials, or do any fitting work, either by their own workmen or through a contractor, in connection with any apparatus supplied by them free, or on any terms of payment or other remuneration that they may from time to time see fit; and they may supply any apparatus free or lend it free of charge. If, however, the Company shall sell any apparatus by way of hire-purehase, the minimum selling price as defined above for sale outright shall be increased to an extent which shall be at least equivalent to 5 per cent. per annum on the deferred payments.

7.—Any cooker or gas-fire which the Company would (according to their terms of supply from time to time), if it were sold by them, fix free wholly or in part, shall, if sold by the Contractor to a consumer of the Company's gas, and if the Contractor and the consumer so desire, be so fixed by the Company; and if the Company give out the work of fixing by contract, the Contractor shall have the option of undertaking the work on the terms hereinafter stated. The Contractor shall have a like option in regard to any cooker or fire supplied by the Company by way of hire or hire-purchase under circumstances entitling the Contractor to commission on the transaction: Provided always that the stove be approved by the Company as suitable for the position in which it is intended to be placed.

8.—In any case where, as an immediate result of a first introduction by the Contractor of a consumer to the Company, the Company effect a sale direct to the consumer of any apparatus to be employed in the consumption of gas in their district, there shall be paid by the Company to the Contractor as commission the difference between the net sum received by the Company in respect of such sale and a sum which would represent a profit (reserved to the Company on the sale of the apparatus) not exceeding 2½ per cent. after all costs of carriage or packing are defrayed. The Company shall, upon request, supply to the Contractor for cash any apparatus for the use of gas, either by way of delivery from their stores or of special purchase, at a not higher price than shall represent the before-mentioned profit of 2½ per cent.: Provided that the said apparatus is to be used in the Company's district. The Contractor shall, before purchasing such apparatus from the Company, give security, by way of deposit or otherwise, to such extent as the Company may require; and the Company shall be entitled at any time to require payment in advance.

9.—The Contractor shall, during the continuance of this agreement (but no longer), be entitled to describe himself as "Agent of the Croydon Gas Company," or, by any like means approved by the Company, to indicate the nature of the arrangement between the parties hereto. The Contractor shall be at liberty to make use of the Company's show-rooms (during such hours as they are open), and of the price lists and other information on the Company's premises, for the purpose of showing apparatus or giving information to his customers. The Contractor undertakes to display in his place or places of business, as far as is reasonably practicable, and in such manner as the Engineer of the Company or his deputy shall from time to time approve, specimens of the cooking and heating stoves or other apparatus from time to time let on hire by the Company. The specimens to be displayed shall be provided by, and remain the property of, the Company; and the Contractor shall so long as they are at his premises, be responsible for them, and shall, when required by the Company, return them in good order, or pay their value to the Company.

10.—The cost of the gas used at the Contractor's premises for the purpose of demonstrating to the public (as aforesaid) the various uses of gas and their advantages shall be borne jointly by the Company and the Contractor; the Company contributing 1s. 2d. per 1000 cubic feet towards the price of the gas so long as the price in the Company's Croydon area of supply is at the rate of 2s. 8d. per 1000 cubic feet. The quantity of gas upon which the said contribution is to be computed shall be determined, by measurement or otherwise, in such manner as the Engineer of the Company or his deputy may from time to time determine.

11.—An account of payments due from the Company to the Contractor under the foregoing provisions shall be rendered monthly by the Contractor to the Company upon a form which the Company shall provide; and the amount thereof, when certified by the Company's Engineer or his deputy, shall be paid to the Contractor.

12.—The Contractor shall indemnify the Company against any claim which may arise in respect of work done or materials supplied by him.

13.—The price to be paid in respect of each stove fixed shall be (unless a special price be previously authorized by the Company in each case) as undermentioned:—

For a cooker—

If the length of pipe laid do not exceed 10 feet	6s. 8d.
Exceeding 10 feet and not exceeding 24 feet . for each foot	8d.
Exceeding 24 feet and not exceeding 40 feet.	16s. 9d.
For each foot beyond 40 feet, ¾-inch pipe	5d.
,, ,, ,, ½-inch ,, ...	4d.

Sheet iron (if required or authorized by the Company, to be placed under, or at the back of, the stove) is to be charged for at the rate of 3d. per superficial foot; the gauge used to be No. 22.

For a heating-stove (not less than ½-inch pipe with clear bore)—

If the length of pipe laid do not exceed 15 feet	10s. 0d.
For each foot beyond 15 feet	4d.
For each flue-pipe, if provided and fixed (including sheet iron for register)	1s. 9d.
Cap to flue-pipe, if required by the Company to be fixed.	6d.

This price to include the provision and fixing of a full-way gas-tap of appropriate size near the stove.

The foregoing prices to include provision of all materials, tools, and labour requisite for carrying out the work, and on its completion cleaning up and repairing all damage done during its execution, to the satisfaction of the Company. No pipe other than sound wrought-iron barrel is to be used, except with the previous express sanction of the Company in each individual case, save that in fixing heating-stoves the pipe exposed from above the floor to the fireplace is to be brass or copper, as the case requires. In calculating length of pipe laid, each fitting (T-piece, bend, &c.) is to be reckoned as 1 foot of pipe.

14.—All exposed iron pipe shall be painted a suitable colour after testing. The setting up and fixing of all stoves is to be done in the best manner practicable, and the materials used are to be the best of their respective kinds and to the satisfaction of the Engineer or his deputy, whose decision shall be final in all questions relating to size of pipes and other manner of carrying out the work.

15.—In fixing each cooking-stove, a separate supply-pipe is to be run direct from the meter, unless previous directions to the contrary are given by the Company in each case. The inside diameter of the pipe to be used in fixing cookers shall be as follows: Half-inch for "Davis's 9," "Fletcher's 115," "Richmond's 100," "Wright's 410," "Acme 226," "Waddon," and any stove of like or smaller sizes; and three-quarter inch for all sizes larger than these.

16.—In fixing each heating-stove, the connection is to be made either direct with the meter or with a pipe which, having regard to the gas already designed to pass through it, is adequate to give a full and sufficient supply of gas to the stove.

17.—The fixing of each stove is to be completed within eight days from the date of the order.

18.—Notice shall be given at the Company's Office, Katharine Street, Croydon, by the Contractor of his intention to commence any work the order for which is issued to him under this agreement. Such notice shall be delivered not later than 9 a.m. on the day of commencement, and shall state the day and hour the work will commence.

19.—The form of order issued by the Company for any work to be done under the agreement will bear a counterfoil form of invoice correspondingly numbered, and the invoice shall be made out in detail by the Contractor on such form, and delivered at the Company's Office not later than the day after the completion of the work.

20.—The agreement may be terminated by notice in writing at any time by either party. On the giving of such notice, the agreement shall terminate forthwith, and such termination shall not give rise on either side to any claim for damage or loss arising directly or indirectly therefrom. On such determination, the Contractor shall forthwith cease to represent himself, directly or indirectly, as an agent for the Company, and shall return all materials supplied to him for the carrying out of the agreement. The agreement shall, however, remain of full force so far, and for such time, as may be necessary to enforce its provisions in regard to any transaction prior to its determination.

COST OF HEATING BY GAS AND ELECTRICITY.

The cooking demonstrations at the Electrical Exhibition have necessarily directed public attention to the cost of performing these operations by electricity as compared with gas; and the subject has lately been discussed in the columns of the "Morning Post." In dealing with questions of heating, there is a not unnatural tendency on the part of technicians to use terms which are not "understanded of the people"—at all events, the section of them who are intimately connected with household management. The correspondent who started the subject, who signed himself "Economist," was probably one of these. He said he did not want to know anything about "thermal units," but the actual cost of raising a quart of water in an ordinary copper kettle from 62° Fahr. to 212° Fahr. This was a straightforward, practical question; and it was answered by a correspondent, in the issue of our contemporary for the 7th inst., as follows:—

The electric energy required to heat one quart of water from 62° Fahr. to 212° Fahr. is about 0·118 (less than one-eighth) of a Board of Trade unit when a self-contained electrically-heated vessel is used, and about one-fourth to one-sixth of a unit if heated in a separate vessel placed on an electrical hot-plate. The amount of gas used, taking the average calorific value of coal gas as 590 Board of Trade units, and the average efficiency of a bunsen burner as 20 per cent., is 3·16 cubic feet. The relative cost, therefore, for heating by gas and electric energy for the particular operation mentioned by "Economist" is exactly the same if the gas is purchased at 3s. per 1000 cubic feet and electric energy at 0·97d. per unit.

One story is good until another is told; and therefore it will be of interest to reproduce, in connection with the above, the following letter by Mr. W. J. A. Butterfield, M.A., F.I.C., which appeared on the 16th inst.:—

The particulars given in reply to "Economist's" question as to the relative cost of boiling a quart of water by gas and electricity are misleading in so far as gas is concerned. I have ascertained by trials the exact consumption of London gas by a common boiling-burner, costing 1s., when a quart of water is raised from 62° Fahr. to 212° Fahr. in (1) a much be-furred iron kettle capable of holding over two quarts, and (2) a clean aluminium kettle of one quart capacity. The first case represents bad, and the second tolerably good, but not ideal, domestic conditions of the use of gas for boiling. The consumption of gas and its cost at the prevailing price (2s. 11d. per 1000 cubic feet) in the City and West End of London were: 1·72 and 1·51 cubic feet, and 0·06d. and 0·053d. respectively for the two sets of conditions named. The gas in question has a somewhat higher calorific power than your correspondent quotes; but, nevertheless, about 40 per cent. of its heating value is utilized in the operation of boiling the water. I hope some of the electricians among your readers will supply the corresponding data for the use of electricity. Figures based on theoretical considerations, such as those given in your issue of the 7th inst., are of no value.

POLITICS IN GAS AFFAIRS AT BRADFORD.

In the course of a lengthy statement dealing from a Party standpoint with the management of municipal affairs in the city, the Bradford Liberal Association refer to the gas undertaking.

They say that, to keep down the rates and make the ratepayers believe they were low and the city was economically managed, the Tories misappropriated the gas profits from 1897 to 1902 to the extent of £106,726, instead of reducing the price of gas to the consumer. This £106,726 averages at £17,787 a year, equal to 3¾d. in the pound off the rates. The price of gas charged under the Tory *régime* to consumers was 2s. 6d. per 1000 cubic feet. From 1898 to 1901, the Tories misappropriated gas funds to the extent of £57,000 more than they made in profits, to reduce the rates and make the ratepayers believe they were low, and thus to keep their Party from being turned out of office. Of this sum, £40,000 had been accumulated by the Liberals as a reserve for contingencies; but this was all swallowed up by the Tories. In March, 1898, the Tories found £21,912 in the coffers; and in March, 1902, they had cleared out nearly the whole amount, leaving only £1274 in hand. The sum of £24,812 expended by the Tories in the promotion of Bills, between 1897 and 1902, was left as a legacy to the Liberals to pay off when they came into office. The cost of lighting the city, which should be a public charge borne by the whole of the community, was, under the Tory *régime*, also taken out of the gas profits, and was therefore borne by the consumers—chiefly the domestic consumers, small shopkeepers, and cottage occupiers—while those who used electric light in their mills and works were relieved of all the burden and cost of street lighting. This is now costing £26,000 a year, equal to 4¾d. in the pound on the rates of the whole city; and this amount is directly saved under the Liberal *régime* to the gas consumers. The Liberals, on taking over the city finances in March, 1902, reduced in two years (1902 and 1903) the price of gas from 2s. 6d. to 2s. 1d. per 1000 cubic feet—a saving of £35,000 to the gas consumers, and equal to taking 6½d. in the pound off the rates. The net increase in rates should therefore be considered not as 1s. 2d., but only as 7½d. under Liberal management. This reduction in the price of gas means an average annual saving to the gas consumers, in houses rated at £10 a year, of 7s. 1d., or 1½d. per week; in £15 houses, 9s. 9d., or 2¼d. per week; in £20 houses, 12s. 6d., or 3d. per week; in £30 houses, £1 0s. 5d., or 4¾d. per week; in £40 houses, £1 4s. 2d., or 5½d. per week. There is, therefore, a direct and substantial financial gain to the gas consumers through having a majority of Liberal councillors. Besides this, the Liberals have raised the wages of the Corporation workmen—the weekly wage-earners—by £15,000 a year, equal to 3d. in the pound on the rates.

Discussing which Party has given the ratepayers the best value for their money, the manifesto compares the last four years of Tory administration, from 1897 to 1901, with the four years of Liberal administration, from 1901 to 1905. Under four years of Tory rule, the rates were raised 1s. 2d., from 6s. to 7s. 2d. in the pound, and the price of gas was increased to 2s. 6d. per 1000 cubic feet for the years 1901 and 1902. The result was gas profits and reserve fund robbed of £79,926. Under Liberal rule, the rates have been raised 1s. 2d., from 7s. 2d. to 8s. 4d. in the pound, and the price of gas reduced from 2s. 6d. to 2s. 1d. per 1000 cubic feet. The results are: Gas reduced 5d. per 1000 feet, equal to 6½d. in the pound off the rates, and a saving to the gas consumers of £35,000 a year; street lighting brighter, better, and the cost (£26,000) transferred from the shoulders of the gas consumers to the rates, which accounts for 3½d. of the 1s. 2d. rise in the rate; wages of working-men increased £15,000 a year, accounting for 3d. more of the 1s. 2d.; unemployed provided work at a cost of £17,000; and gas-works and plant modernized and brought up to date and earning a profit, instead of incurring, under Tory rule, an actual loss of £9283.

GAS AT THE BREWERS' EXHIBITION.

The Twenty-Seventh Annual Exhibition of machinery, appliances, and produce used by brewers, licensed victuallers, and others, which was held, as usual, at the Agricultural Hall, Islington, from the 14th to the 20th inst., calls for notice in our columns, as its predecessors have done, from the fact that gas is largely used by, at all events, one of the classes of tradesmen named above, for both lighting and heating. It is therefore advisable that they should be kept informed as to the latest appliances suitable for these purposes. This was done, at the exhibition just closed, by several firms whose names are well known in connection with the gas industry. Taking lighting first, Messrs. W. Sugg and Co., Limited, who have not of late years been exhibitors, had a fine show of incandescent gas-lights, some of which were working under pressure, and a good collection of cooking stoves and ranges, as well as ventilating appliances for kitchens. In the gallery, Messrs. A. E. Podmore and Co. had a stand where could be seen the Podmore and Thomas high-power gas-lamps. The Richmond Gas Stove and Meter Company, Limited, occupied their accustomed place in the hall, and, as usual, had an excellent show of all kinds of cooking appliances for hotels, clubs, restaurants, &c., and also complete installations for ordinary and prepayment supplies. Another firm who always have an attractive stand at these exhibitions is Messrs. S. Clark and Co.; and their collection of "syphon" and bar stoves, gas mullers, radiators, and heating-stoves for oil and gas was thoroughly representative of their manufactures. In the department of motive power, Messrs. Crossley Bros., Limited, showed two engines—one of 8·5 and the other of 12·5 effective horse power when working with suction producer gas, and of 12 and 16 horse power respectively when using ordinary coal gas. These engines were fed from one of the firm's No. 2 suction gas plants, and were employed for lighting stands. The other exhibitors of motors were the National Gas-Engine Company, Limited, and Messrs. Bilbie, Hobson, and Co., who showed a Stockport engine at work. As brewers require to use thermometers and indicators for taking temperature and testing vats for the presence of carbonic acid gas, they were afforded an opportunity, by the Hohmann and Maurer Manufacturing Company, of making a selection from a varied collection of these instruments.

SALE OF GAS STOCKS AND SHARES.

Last Tuesday, Mr. Alfred Richards resumed, at the Mart, Tokenhouse Yard, E.C., his periodical sales of gas and water shares and stocks. On this occasion the parcels offered were all in the former category, and they included two new issues by order of Directors. The first lots consisted of some £10 shares in the Uxbridge and Hillingdon Gas Consumers' Company, ranking for a maximum dividend of 7 per cent. per annum; that paid for the last five years having been at the rate of £6 6s. They fetched £12 to £12 5s. each; and the purchasers will take the dividend accruing from the 31st inst. Next came £500 of consolidated ordinary stock of the Lea Bridge District Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; the last having been 1 per cent. more than this. The stock realized £125 10s. to £126 per £100. Some "B" 7 per cent. stock of the Horley District Gas Company (last dividend 5¼ per cent.) was sold at from £103 to £106 per £100. A new issue of £5000 of 4 per cent. perpetual debenture stock of the Crays Gas Company was placed at prices ranging from £100 to £101 10s. per £100; the purchasers taking the interest as from the 1st prox. A parcel of £800 of original ordinary consolidated 10 per cent. stock of the Brighton and Hove General Gas Company, the last dividend on which, under the sliding-scale, was at the rate of 11¼ per cent. per annum, fetched from £235 to £236 per £100. The final lots consisted of consolidated ordinary stock of the Chigwell, Loughton, and Woodford Gas Company, carrying 5 per cent. dividend. It was put up in £100 lots; and they were sold at £5 premium, *cum. div.* as from July 1 last.

Louth Gaslight Company.—The Directors of the Louth Gaslight Company, in their report for the year ended Sept. 30, call attention to the satisfactory result of the twelve months' working. The success of the slot-meter system for lighting and cooking purposes anticipated in the last report has been amply justified by results. The Board deemed it desirable to strenuously oppose the attempt by the Town Council to obtain the leave of the Local Government Board to borrow £17,000 on the security of the rates for the purpose of introducing electric light into the borough. The Directors employed Counsel and experts to represent them at the inquiry; and they think the shareholders are to be congratulated upon the refusal of the Local Government Board to consent to the proposal of the Council. The price of gas was reduced 4d. during the year, entitling the shareholders to an increase of 1 per cent. in the dividend; and the Directors have been able to place £500 to the contingent fund. Dividends are recommended on the original capital at the rate of 14¼ per cent., on the improvement stock "A" and "B" of 5 per cent., and on the new ordinary stock (1877) of 11¼ per cent. These will absorb £2005, and leave a balance of £343 to be carried forward.

FRENCH MUNICIPAL COUNCILLORS AT THE HAMPTON AND STAINES WATER-WORKS.

The programme arranged for the visit of the members of the Paris Municipal Council to London last week, as the guests of the County Council, included an excursion to Windsor on Friday; and opportunity was then taken to accept an invitation of the Metropolitan Water Board to inspect their works at Hampton and Staines. The party left Waterloo Station shortly after ten o'clock, and reached Hampton, which was gaily decorated for the occasion, by half-past ten. On arriving at the works, the company, which included many members of the County Council, were received by Sir Melvill Beachcroft, the Chairman of the Board, with whom were the Vice-Chairman (Mr. J. Glass), the Chairman of the Works Committee (Mr. E. B. Barnard), the Clerk (Mr. A. B. Pilling), the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.), the Deputy Chief Engineer (Mr. J. W. Restler, M.Inst.C.E.), and others. Addressing the President of the Municipal Council (Dr. Brousse) in French, Sir Melvill Beachcroft said he felt it an honour to welcome, on behalf of the Board, the members of the Municipal Council of Paris. He explained how the Board had come into existence, and gave a few particulars of the extent of the works and the sources of the water dealt with by them—the River Thames being the chief. He remarked that his hearers must have experienced in Paris the great necessity of having a pure and abundant supply of water, and of steadily maintaining it; and therefore in the Board's undertaking he thought they might count upon the sympathy of their Parisian colleagues. There were few more important questions to municipalities than that of the methods of water purification and distribution; and as on these there was always something to be learnt, they would be most pleased to confer with their guests in regard to them. A tour was then made of the buildings and works. The mains which convey the water from three sets of triple engines into the trunk main were first inspected, and then the pumping-stations, boiler-house, workshops, filters, and methods of cleaning the sand used in purification. At the close of the inspection, refreshments were served in a marquee, and the visitors left for Staines in motor cars and omnibuses lent by members of the Board and others, or chartered under instructions from Sir Melvill Beachcroft, who had made every possible arrangement for the comfort and enjoyment of his guests. On arriving at Staines, the features of technical interest in the reservoirs and works were explained by Mr. Bryan. After an inspection of the pumping-station and engine-house, the party were driven on to Windsor, where, with cordial expressions of appreciation, they took leave of their host and his colleagues on the Board.

LIVERPOOL CORPORATION WATER SUPPLY.

Inauguration of a Second Pipe-Line from Vyrnwy.

On Monday last week, the ceremony of opening the second line of pipes which has been laid from Lake Vyrnwy for the supply of Liverpool was performed by Alderman Burgess, the Chairman of the Water Committee of the Corporation, at Prescot, in the presence of a numerous company, which included the Lord Mayor (Mr. John Lea), members and officials of the Corporation, and the Water Engineer (Mr. Joseph Parry, M.Inst.C.E.), by whom the work was carried out.

When the scheme for the supply of Liverpool from Lake Vyrnwy was decided upon, it was considered advisable to acquire an easement 33 feet wide between the lake and the city, in which to lay such pipe-lines as might be required. The intention was to convey the water in three instalments; the lake being of sufficient capacity to store and utilize the whole of the rainfall on the 23,000 acres over which the Corporation have the right to collect water. The scheme, it may be remembered, was divided into six sections; and the following table shows not only the length of each, but also the total length of aqueduct to the storage reservoirs at Prescot:

	Miles.	Yds.
From the Hirnant Tunnel outlet to the River Morda, near Oswestry	13	670
,, Oswestry to Ellesmere	9	98
,, Ellesmere to Malpas	8	1104
,, Malpas to the Cotebrook reservoir	11	898
,, Cotebrook to the Norton tower	10	1620
,, Norton to Prescot	8	1114
	62	224
Special crossings not included in the above contracts and completed tunnels	5	2254
Total length of aqueduct to Prescot	67	1478

The original estimate for carrying out the new pipe-line, which will discharge about 16 million gallons of water daily, was £785,000; but the work has been completed for an expenditure of some £50,000 less than this sum—a fact on which the Chairman and the members of the Water Committee, the Engineer, and all who have been engaged upon it, are to be congratulated.

The company were conveyed to Prescot in special tramcars; and the inaugural ceremony took place shortly after noon.

The Lord Mayor expressed his pleasure at being enabled, in his official capacity, to assist in the day's function. They had met, he said, to open the second pipe-line from the magnificent supply at Vyrnwy, where there was an enormous quantity of water, the only difficulty being to get it to Liverpool. This, however, would now be overcome by the completion of the conduit to be inaugurated by Alderman Burgess, the esteemed Chairman of the Water Committee, who was worthy of any honour the City could confer upon him. To bring an extra 16 million gallons of water a day into their district was indeed a very important undertaking; and they were grateful to the officials and others who had brought that work to so successful an issue. They were very pleased to see the immense quantity of water in stock; and they ought to pride themselves, as a city, upon rendering so great a service to the district. It was satisfactory from the ratepayers' point of view to know that when the necessary arrangements were completed for the filter-beds at Oswestry, there would be no further source of outlay in regard to the water supply for a long time. So far as the Engineers could see, there would be no necessity for increased capital expenditure for twenty years, when those in office then might have the pleasure of turning on the third pipe-line. His Lordship then asked Alderman Burgess to turn on the water, and presented him with a beautiful silver cup as a memento of the interesting occasion. They all trusted Alderman Burgess would continue his valuable services to the City for a long time.

Alderman Burgess, who was received with loud applause, said he was very grateful for the kind words spoken regarding himself, and for the very handsome cup they had been good enough, on behalf of his colleagues and the Council, to present to him on this occasion. Before performing the duty which had been imposed upon him by the Lord Mayor at the request of his colleagues on the Water Committee, he thought it would, perhaps, not be out of place to say a few words regarding the important work, the completion of which they were commemorating. Not much more than a hundred years ago, the water supply of Liverpool was carried to the population in carts, which were described as having been "dangerous vehicles perpetually encumbering the streets, stopping up the narrow ones entirely, or unexpectedly crossing the way of passengers." From these carts the water was distributed by means of tin cans; and altogether the good old town used 100,000 gallons every day—the chief source of supply being a well near the south end of St. George's Hall. But their predecessors about that time found it needful to make further provision for the requirements of the growing port; and, with the help of the Lord Derby of that time, who, like his successors, was always friendly to Liverpool, a supply of 720,000 gallons a day was brought from Bootle. This was recorded as having been "a quantity fully competent to supply the whole of this immense town and of the shipping resorting thereto." He mentioned these facts, not because he was going to give his hearers a history of the fluctuation in Liverpool prosperity, or of the gradual increase in the water supply found necessary during the years that had intervened, but because he thought it might be interesting to remember them, and to contrast the old methods and requirements with the means adopted for affording a supply of water at the present time, and the enormous consumption which those who were entrusted with this important undertaking were called upon to provide for. The city had, as they knew, three chief sources of supply—Vyrnwy, Rivington, and the wells in and around Liverpool; and the consumption of water was not far short of 30 million gallons daily. He would say nothing that day of Rivington and the wells, from which two sources they usually drew about 15 million gallons daily, because the pipe-line which had now been completed was a portion of the Vyrnwy scheme which was adopted and devised by the wisdom of those who went before them. The lake at Vyrnwy was capable of providing Liverpool, when it was fully utilized, with something more than 40 million gallons of water per day; and the scheme provided for three lines of pipes, each of which was constructed to bring about 14 million gallons. The Corporaton who obtained parliamentary sanction to the Vyrnwy works in 1880 wisely decided to convey the water in three instalments—thus postponing a large portion of the capital expenditure which would have been involved by the completion of the whole work at one time; and the first line of pipes was completed and the water delivered into Liverpool thirteen years ago. Since the introduction of the Vyrnwy supply, the consumption of water, both for trade and domestic purposes, had increased rapidly; and in 1902 the City Council decided, on the recommendation of the Water Committee, to lay a second line of pipes, at an estimated cost of £785,000. This line of pipes had now been laid; and, while it was difficult to speak quite exactly, a careful examination of the accounts showed that, including necessary subsidiary works which were named in the estimate, the cost would be at least £50,000 less than was anticipated. It had, of course, needed great care in deciding where and when to place orders for various parts of the work, and constant and careful supervision to bring about this result; but they had never for one moment sacrificed efficiency to economy, but had been determined, from first to last, that the work should be done in the best and most enduring manner. The City Council adopted very readily the proposals of the Water Committee to do this work, although there might be some who thought they were perhaps a little premature. Recent experience had, however, shown the wisdom of forethought; and all would now agree that their calculations as to the growing needs of the district of supply were very accurately gauged. When he asked the Council to sanction these works, he made a promise which had been more than fulfilled, for he stated, on behalf of his colleagues on the Committee, that he believed it would be possible to complete the work, notwithstanding its great cost, without increasing the charges for water. Since that time, they had not only constructed this line of pipes, but the Rivington watershed had been purchased; and, while the water-rate of 6d. in the pound remained of necessity stationary by statute, the water-rent for domestic purposes had been reduced from 7½d. to 4⅜d. in the pound; and the City Council paid a compliment to the Water Committee, which it regarded as unduly cautious, by fixing even a lower rate that the prudent Committee recommended. The new pipe-line was 67 miles in length; and the fact that it had been well and truly laid in about three years was the best tribute he could offer to the skill and energy of their able Chief Engineer, Mr. Parry, and of those whom he knew Mr. Parry would desire him not to leave unmentioned—the junior engineers by whom he had been assisted.

Having made passing reference to two members of the Water Committee who had manifested great interest in the work now completed, Alderman Burgess said that when his friends, six years ago, did him the honour to place him in the chair of the Committee, it was his hope that he might be able to retain the position long enough to see this work through; and though he felt that the duty which they asked him to undertake that day ought to have been placed in the hands of someone more distinguished, he was grateful to them for having asked him to send this second instalment of Vyrnwy water into Liverpool. Perhaps

he might express the hope that great representative bodies such as the Liverpool Corporation, and especially the new Metropolitan Water Board, would at all times take a serious view of the responsibility of their position, and never hesitate to take any steps that might be needful to ensure for the communities they served a constant supply of water, sufficient in quantity for all domestic, sanitary, and trade purposes, and free from the smallest taint of impurity and contamination.

Alderman Burgess then, amid loud cheering, turned on the new supply of water, and in the course of a few minutes it was flowing into the reservoir at the rate of 16 million gallons a day. The effect was soon appreciable in the gradual rising of the water on the embankment; and the quantity stored in this and the surrounding reservoirs, which are constructed on what was formerly a corner of Knowsley Park, indicated that there need be no fear of a lack of water supply for many years to come.

Votes of thanks having been accorded to Alderman Burgess and the Lord Mayor, the company inspected the new reservoirs, and then repaired to the King's Arms Hotel, where they partook of luncheon under the presidency of Alderman Burgess. After the loyal toasts had been honoured, and the health of the Lord Mayor drunk, Alderman Oulton proposed "The Water Engineer," and the toast was cordially received. Mr. Parry, in responding, acknowledged the kind way in which his services had been alluded to. He spoke of his indebtedness to those who had assisted in carrying out the undertaking just inaugurated and bringing it to a triumphant issue. He had had a long and wide experience of contractors, and in the undertaking there were between forty and fifty firms engaged, and he was indebted to them for the successful manner they had carried out their work. Then there were his own assistants, resident engineers and others, indoor and outdoor. He could not speak too highly of the way in which they had served the interests of the Corporation. Mr. Parry also acknowledged his great indebtedness to the Chairman, who, notwithstanding the pressure of business, always found time to give advice and assistance, and guidance in matters which had to be dealt with. It would be a great loss to the city if anything took Alderman Burgess away from the position of Chairman of the Water Committee. The other toasts were "The Contractors," responded to by Colonel A. Hill Holme, and "The Chairman," briefly acknowledged by Alderman Burgess.

SHREWSBURY WATER SUPPLY.

The Upland Scheme Favoured by the Ratepayers.

A Special Meeting of the Shrewsbury Town Council was held on Tuesday, to consider the report of the Special Committee appointed to record the vote of the ratepayers, which was decided to be taken early in July, with respect to the Castle Pulverbatch upland scheme and the river water scheme for the supply of the town. The Mayor (Mr. H. J. Hearn) presided. The Committee reported that the voting was as follows: For the upland scheme, 1923; for the river scheme, 923—majority for the upland scheme, 980. The Mayor, in proposing the adoption of the report, said it was not for him to suggest what course the Council should now take. He reminded members, however, that they had pledged themselves to loyally support whichever scheme was adopted by the ratepayers. Mr. Laing claimed that the vote showed that there was an emphatic feeling in favour of the upland scheme, and that it was the duty of the Council to go forward. He moved that the Water Committee be instructed to take such steps as were necessary for carrying out the Castle Pulverbatch scheme. Mr. Kent Morris seconded the motion. Alderman Deakin submitted that the vote was not conclusive, as there was a majority of ratepayers who might cast their votes against the Committee when they came to take a statutory vote. He contended that before involving the town in an expenditure of thousands of pounds, the Council should have further evidence as to the quantity and quality of the upland water, and that they should also have more definite information as to the cost of the scheme. He pointed out that no provision had been made for acquiring control of the gathering-ground, and urged that this was absolutely necessary if purity of the water was to be ensured. He moved, as an amendment, that, before promoting an Act of Parliament or incurring any further considerable expense with regard to the upland scheme, the Water Committee be instructed to ascertain and report as to the probable cost of obtaining the control of the gathering-ground by lease or purchase; and also to obtain further information as to the quality and quantity of the water available. Mr. Adams seconded the amendment. Alderman Morris, the Chairman of the Water Committee, said he accepted the amendment as an honest attempt to clear up some points of difference, though personally he had no doubts as to the quantity and quality of the water. Alderman Lloyd, the Chairman of the Finance Committee, said he would vote for the upland scheme, always reserving the condition that it did not cost more than £148,000, because he was sure the finances of the borough could not afford a larger expenditure. In the result, the motion was withdrawn, and the amendment was carried unanimously.

Launceston Gas Company and their Water Supply.—It having come to the knowledge of the Launceston Town Council that the Gas Company were using the public water supply at their works without payment being made, the Town Clerk wrote calling attention to the matter. In reply, the Secretary said the Directors, on investigation, had found that the contention of the Council was right, and that they had been using the town water without payment. The Board, however, were not aware that this was the case, until their attention was called to the fact. He added that the Company were quite prepared to make payment in full for the water so taken. The whole of the facts are being investigated; and when a decision is arrived at as to how long the water has been used, a formal claim will be sent in to the Gas Company.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I have received from the Town Chamberlain of Kilmarnock a copy of the abstract of the accounts of the Town Council for the year ending May 15. These accounts, as I have more than once observed, are prepared with the utmost care and clearness, and their statement is a credit to all concerned. In the gas account, it is set forth that the original capital, which amounted to £50,000, has been written down by £30,795; leaving £19,205. The new works have cost £38,223, of which £2692 was incurred last year; and the capital account now stands at £57,428. The revenue for the year amounted to £25,046. Of this sum, £20,844 was received for gas; £3127 from the sale of tar and sulphate of ammonia; and £1042 from the sale of coke. The manufacture of gas cost £16,868, made up of: Coal, £9197; lime, £426; retorts, £385; stabling, £110; maintenance of works, £567; salaries and wages, £5705; and cartage, £478. Distribution of gas cost £1965, of which £1283 was for meters. Rates and taxes amounted to £1353, general administration to £494, and general charges to £500. The total expenditure was £21,182, which left a gross profit of £3864. In the net revenue account, there was a balance on hand at the beginning of the year of £5406. A sum of £1000 was placed to the sinking fund, interest cost £1753, a deficiency of £1052 on the electricity account was paid, £70 was written off for bad debts, and the amount carried forward is £5397. Out of the sinking fund account a sum of £3500 was applied in paying off loan debt, and £181 is carried forward. There are mortgage debentures to the amount of £51,874, and a temporary loan of £2000. The value of the works is £53,928. The quantity of coal carbonized was 17,946 tons, of an average price of 10s. 3d. per ton. The quantity of gas made was 163,354,700 cubic feet, of which 152,513,283 cubic feet were accounted for; the loss amounting to 7·10 per cent. In the year preceding, the quantity of gas made was 157,203,400 cubic feet, and the loss 9½ per cent. The price was 2s. 8½d. per 1000 cubic feet, as compared with 2s. 11d. the previous year. The income per ton of coal carbonized amounted to £1 7s. 11·52d., and the expenditure to £1 3s. 7·22d. The income per 1000 cubic feet of gas was 3s. 0·79d., and the expenditure 2s. 7·11d. The mortgage bonds per million cubic feet of gas amount to £316; and per 1000 cubic feet to 6s. 4·22d. The profit realized on the year's working was equal to 7·44 per cent. Everything is tabulated and brought out in the clearest manner possible, as, for instance, the cost of maintenance of works per 1000 cubic feet is stated at 0·83d., the cost of wages of workmen at 7·83d., the cost of salaries of managers at 0·55d., and the cost of coal at 1s. 1·52d. It is shown that the quantity of gas made in 1894 amounted to 84 million cubic feet, and that there have been increases every year since then, with the exception of 1903, when, I suppose, the old works were unable to keep up the supply, and there was a drop of 3½ million cubic feet. In 1894, the leakage amounted to 12 per cent.; and it has gone down almost continuously since then. Then the average make of gas per ton of coal was 9100 cubic feet. Last year it was 9200 cubic feet. The revenue from gas was at that time £12,257; now it is £20,844. The income from residual products was then £2241; now it is £4169. The price of gas then was 3s. 1½d. per 1000 cubic feet; it is now 2s. 8½d. The record is one of which any gas manager might be proud; and the Messrs. Fairweather, who manage the gas undertaking at Kilmarnock in so capable a manner, are to be congratulated upon the continued success which attends their labours.

Some persons, whose partisanship appears to be stronger than their sense of justice, have been maligning the new gas-works at Falkirk, which are now nearing completion. A question was asked upon the subject at one of the meetings of ratepayers in connection with the election; and it was referred to by Provost Christie in the Town Council on Monday. He stated that Mr. Roy, of Carron, who was a practical man, had been invited to visit the gas-works, and that he had expressed himself as perfectly satisfied with the design of the works, and the way in which their erection had been carried out. He examined carefully the walls and roof, and, considering the nature of the ground, was surprised to find that so little subsidence had taken place. His opinion was that the works had been constructed in the most up-to-date and, in fact, advanced manner. Provost Christie was pleased to learn that the cost of the works was to come out at less than was estimated. Thus this ghost, which was doubtless intended to walk through the election, has been promptly laid by the authorities.

Another election story crops up in connection with the alleged smells from the Granton Gas-Works. Judge M'Kelvie, at a meeting of electors of Leith the other night, said something about the "agitation" over the smells—it does not matter what, because the only interest in the incident is to be found in the reply of Mr. M'Kelvie to a writer who attacked him in the pages of the "Scotsman." Even in Mr. M'Kelvie's letter in reply, the interest is confined to the remarks that he communicated with almost every gas-works in the United Kingdom to ascertain their method of purification; and that he was in a position to state that Mr. Herring had tried almost everything known to chemical science, at a cost of nearly £10,000, with the view of reducing the smells complained of, and that they had been reduced almost to a minimum. He considers that it would be better, in the interests of the community, that, instead of paying a lawyer to keep the agitation alive, the agitators should employ an expert, who would go to Granton, ascertain what was being done, consult with the Engineer, and, if he could suggest anything of a practical nature, Mr. Herring would be only too pleased to give effect to it.

In the annual report of Mr. G. A. D. Mackay, the Inspector of Cleaning and Lighting for the Corporation of Edinburgh, it is stated that at May 15 last the city was lighted by 7483 ordinary gas-lamps, 2618 incandescent gas-lamps, and 997 electric arc lamps; and that there were 11,331 gas-jets on common stairs. The total lighting expenditure for the year was £43,208, of which £21,078 was for gas lighting, including the cost of the gas, lamplighters' wages, and incidental expenses; £11,369 was for electric lighting, exclusive of incidental expenses; and £10,760 was for stair lighting, including cost of

gas, wages, and incidental expenses. The lighting expenditure showed an increase of £4625 over the preceding year, due to the extension of incandescent gas and stair lighting. The cost per head of the population was 2s. 6¾d., and per £1 rental, 3¾d., as compared with 2s. 3¾d. and 3½d. respectively in 1904.

It is with feelings of amazement that we sometimes discover how little common sense there is displayed in the working out of the ordinary affairs of life. One such instance was disclosed at a meeting of the Electric Lighting Committee of the Edinburgh Town Council on Thursday, when it was reported that the Inspector of Cleaning and Lighting had written to the Electrical Engineer asking if his Committee would be prepared to light common stairs by means of incandescent electric lamps. From the Castle Hill to the foot of Canongate was suggested as a suitable district in which to furnish the light. How foolish this notion was, was soon proved by the Electrical Engineer, who pointed out that the district was one of the poorest in the city, the houses in it were not wired, and that therefore to introduce electric lighting into the common stairs would probably not lead to other business. He suggested, however, that in better-class districts it would; and in that case the original outlay could be somewhat reduced, because the service mains would be common to the stairs and the houses. He estimated that the average cost for installation per lamp would be about 35s., and that the annual cost would be about £1 per lamp, of 5-candle power. The Committee, having had their eyes thus opened, resolved to drop the poorer quarters, and to offer to light stairs in districts where the wires are already in the houses at the rate of £1 per lamp per annum.

While in London public lighting by electricity is being giving up in favour of lighting by gas, the opposite is taking place in Fochabers. Fochabers is a village in Morayshire, with a population of some 1200. There are about 30 public lamps in it; and the charge for gas is 10s. per 1000 cubic feet. This latter fact explains how it is expected that, in using incandescent electric lamps, there will be a saving of about £9 per annum. The electric lamps, it is explained, will give a light of 32 candles each, instead of the 16 candles obtained from the gas-lamps. It has been agreed to borrow money for the original capital outlay; a local lender being willing, so it is said, to provide the money at 4 per cent. interest, and to be content with any surplus there may be by way of repayment of principal. Truly a most accommodating lender in the meantime.

I missed Mr. L. Hislop, of Uddingston, from the meeting of the Scottish Junior Gas Association in Glasgow last Saturday. I now learn that a few days previously he underwent a surgical operation for double appendicitis, in a private hospital in Glasgow. I am able to make the announcement that he is progressing satisfactorily towards recovery, and that, if he continues to improve as he is doing, the probability is he will be able to resume his duties about the end of November. His many friends will join in the wish that this may be fully realized.

The Aberdeen Town Council on Monday agreed to a request by the Turriff Gas Company that Mr. S. Milne, the Engineer and Manager, should be allowed to make a valuation of the works of the Company.

I give more than usual prominence to an exhibition of gas appliances which was held in the Drill Hall in Peebles this week, for the reason that Peebles occupies an unusual position in the matter of the supply of gas appliances. The goods exhibited were those of Messrs. Fletcher, Russell, and Co., Limited. An exhibition which was held in 1899 was an extraordinary success in the way of promoting the sale of gas-cookers; and the aim of the present exhibition was to stimulate the sale of heating and lighting appliances. It was opened on Tuesday afternoon by Provost Ballantyne, who said that they possessed large new gas-works in Peebles, and were able to make as much gas as the heart of anyone could desire; but all the ratepayers had to pay for those works, and there were two ways in which they could do it—either to burn more gas, or to pay more for the gas they burned. It was better for them, he thought, to burn more gas, and get more comfort, in light and heat, from it. Mr. J. Kemp, the representative of Messrs. Fletcher, Russell, and Co., said he did not remember an exhibition where such a large number of cookers was asked for as the last exhibition in Peebles. He did not know of a town which could boast that there were only nine houses in it which had not got gas-cookers. He personally thanked the officials of the Gas Committee—Mr. A. Bell, jun., and Mr. W. H. Williamson—who had practically taken all the arrangements for the exhibition upon themselves. Mrs. H. M. Young lectured during the week. The exhibition closed last night. To-day it is reported that it has been a decided success, quite a large number of orders having been given; while it is believed that many more will yet come in.

Gas-Works Extensions at Burnley.

At the Burnley Town Hall, on Thursday, Mr. M. K. North, M.Inst. C.E., one of the Inspectors of the Local Government Board, conducted an inquiry into the application by the Town Council for power to borrow £25,435 for the purposes of their gas undertaking. It was stated that the sum borrowed for gas-works purposes was £271,335, and the amount of loan paid off £93,629; the balance of outstanding debt being £177,706, less £12,943 accumulated for the redemption of stock. From gas for the last six years, the profits had amounted to £10,758. The loan was made up of two items—£2435 for the purchase of land, and £23,000 for extensions of plant at the works. In order to meet the requirements of the future, it would be necessary for the Corporation to have manufacturing plant capable of producing 4 million cubic feet of gas daily. There was now a maximum consumption of 3,241,000 cubic feet per day. One of the retort-houses was in an obsolete condition; and rather than reconstruct it, it would be more economical to erect a modern one elsewhere in the works, and throw the old one out of use. It was also stated that for the last three or four years there had not been large increases in the consumption of gas; but this had been due to the introduction of incandescent lighting into the mills and workshops. The number of mills and other property now being put up would, however, cause a greater demand in the future.

Proposed Purchase of the Weston-super-Mare Gas-Works.—The Weston-super-Mare Urban District Council have appointed the Finance Committee and one other member of the Council to consider and report as to the advisability or otherwise of the Council promoting a Bill in the next session of Parliament for the purchase of the Gas Company's undertaking; the Committee being empowered to obtain such expert assistance as they may deem advisable. The Council are acting under the powers conferred upon them by the Weston-super-Mare Gas Act, 1901.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 229.

Issue.	Share.	When Div.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21—22½*	+¼	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	14—14½*	..	5 3 5
200,000	5	May 12	6¼	Bombay, Ltd.	6¾—7¼	..	4 9 8
140,000	5	,,	6¼	Do. New, £4 paid	5¾—5¾	..	4 10 6
50,000	10	Aug. 31	14	Bourne-mouth Gas and Water Pref. 10 p.c.	29—30	..	4 13 4
51,810	10	,,	7	Do. B 7 p.c.	16¼—17½	..	4 0 0
53,200	10	,,	6	Do. Pref. 6 p.c.	15¼—16¾	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	9¾	Do. New	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
206,250	,,	June 15	4	Do. 4 p.c. Deb.	103—106	..	3 15 6
220,000	Stk.	Sept. 15	11¼	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8¼	Do. A. Ord. Stk.	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c.	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	89—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12⅞—13¼*	..	5 5 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
150,000	20	July 13	8¼	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Apl. 28	4½	Do. 4½ p.c Pref.	10¼—10⅝	..	4 3 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,400,000	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk.	116—119	−1	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do.	113—115	..	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6	Continental Union, Ltd.	119—122	−1	4 18 4
200,000	,,	,,	7	Do. 7 p c Pref.	137—142	..	4 18 7
424,070	Stk.	—	5½	Derby Con. Stk.	—	..	—
55,000	,,	June 3	4	Do. Deb. Stk.	—	..	—
486,090	10	July 28	11	European, Ltd.	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,223,235	Stk.	Aug. 16	4⅘	Gaslight & Coke 4 p.c. Ord.	100—101	..	4 7 2
2,600,000	,,	,,	3½	Do. 3½ p.c. max.	90—92	..	3 16 1
3,709,735	,,	,,	4	Do. 4 p.c. Con. Pref.	110—113	..	3 10 10
4,193,975	,,	June 15	3	Do. 3 p.c. Con. Deb.	86—88	−1	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101	..	4 19 0
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	19½—20½*	..	5 7 4
3,800,000	Stk.	May 12	10	Imperial Continental	219—222	..	4 10 1
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	122—127	..	4 14 6
561,000	Stk.	Aug. 16	10	Liverpool United A	229—231	+3	4 6 7
718,100	,,	,,	7	Do. do. B	172—174	+1	4 0 6

Issue.	Share.	When Div.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Oct. 2	5	Met. of 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 31	3⅝	Monte Video, Ltd.	12—13	+½	5 7 8
1,565,892	Stk.	July 29	4	Newc'tle & G'tesh'd Con.	106—107	..	4 6 5
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd.	14⅝—14⅞	..	5 7 5
600,000	5	Sept. 14	7	Ottoman, Ltd.	6—6½	..	5 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord.	6½—7	−⅛	4 5 9
796,980	5	July 28	5	Do. 5 p.c. Pref.	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
851,070	10	Oct. 13	7	River Plate Ord.	13—13½*	−⅛	5 3 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd.	13—13½	..	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb.	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	239—241	..	4 3 0
523,498	,,	,,	10	Do. C	239—241	..	4 3 0
126,106	Stk.	Aug. 31	5⅛	Shrewsbury Ord. 5 p.c.	104—106	..	5 3 9
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	128—130	−2	4 4 7
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	May 12	5	Southampton Ord.	111—114	..	4 7 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham and Edmonton A 5 p.c.	122—125	..	5 0 0
363,020	,,	,,	4½	Do. B 3½ p.c.	96—99	..	4 16 0
125,000	,,	June 29	4	Do. 4 p.c. Deb.	105—108	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd.	9⅜—10½	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7⅜	Wandsworth A 5 p.c.	—	..	—
255,636	,,	,,	6¼	Do. B 3½ p.c.	137—140	..	4 9 3
60,000	,,	,,	5⅞	and C 3½ p.c.	113—116	..	4 13 6
57,564	,,	June 29	3	Putney 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord.	104—106	..	4 14 4
185,000	,,	,,	5	Do. 5 p.c. Pref.	122—125	..	4 0 0
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex. div,"

CURRENT SALES OF GAS PRODUCTS.

Week ending Oct. 21.

Tar products in the London market have fully maintained the recent advances, and are generally in a better position now than they have been for some considerable time past. 90 per cent. benzol is in very fair demand at 10½d. net. 90 per cent. toluol would not be sold at under 11d. net. Solvent naphtha is also better, and 11d. has been refused for 90-160, and 1s. 1d. net. has been made for 95-160; casks free in each case, and delivered f.o.b. London. 60 per cent. crude carbolic is 1s. 8½d. buyers, and 1s. 8⅝d. net sellers. Pyridine is again much inquired for, and is quoted at from 7s. to 7s. 6d. net on the old test. Ordinary creosote has been done at 2d., and 2⅛d. net is now being required naked at sellers' works. Makers are fully sold. A considerable business has also been done in liquid creosote, for which 2½d. net naked is now asked. Pitch has still further advanced, and 33s. 6d. has been done for a fair quantity, and 34s. 6d. to 35s. is now required by makers. Sulphate of ammonia has been a little neglected during the week, which has been, on the whole, rather a satisfaction to makers, as the position was being somewhat forced and stocks too much depleted. Prices still range from £12 17s. 6d. to £13 per ton on Beckton terms for prompt and to the end of the year.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 21.

The market remains very firm, more particularly in Scotland, the Leith price having been advanced to £12 17s. 6d. per ton f.o.b. Quotations at the close are £12 16s. 3d. to £12 17s. 6d. per ton f.o.b. Liverpool, and £12 12s. 6d. per ton f.o.b. Hull. Demand has been mainly for covering October contracts; direct orders being rather scarce. In the forward position, there has again been good inquiry; but while makers are holding for a premium on spot prices, speculators have begun to offer abroad at about the spot level, so that any orders taken have been taken speculatively.

Nitrate of Soda.

This article is firm on spot, owing to limited supplies; and the quotations remain 10s. 9d. and 11s. 3d. per cwt. for ordinary and refined qualities respectively. The forward position seems to be a shade weaker.

Tar Products. LONDON, *Oct.* 21.

Markets have been very firm during the past week, and there has certainly been more activity all round. In benzol, a fairly good business was done at 10½d. for 90 per cent. f.o.b. London for forward delivery; but so far as prompt is concerned, there do not appear to be any stocks available. In 50-90 per cent., sales are reported at 9¾d. to 10d., according to situation; but the quantities disposed of do not appear to have been very large. Toluol is still in strong demand, and a small quantity is reported to have been placed at 11d. f.o.b. London; while as regards the Provincial makers, they are not offering anything just at the present time. Solvent naphtha is very scarce indeed. Some ordinary 90 per cent. at 160° was sold at 10½d. London for early delivery; while the demand for the special heavy qualities continues very good. So far as London is concerned, creosote is very firm; and for delivery all over next year the largest manufacturers ask 1⅞d. For prompt delivery, however, there is not so much doing in the ordinary salty oil; but the demand for liquid quality continues very good. In carbolic, there has been a fairly good business doing at 1s. 8½d. f.o.b. London for October-December delivery; but it is reported that over this price was declined for January-June by one of the principal refiners here. In crystals, there does not appear to be very much doing at the present time; and the market remains quiet. There is absolutely nothing to report as regards anthracene; and neither makers nor consumers seem to take any interest in same. Pitch appears to have been in very strong demand during the past week, and large contracts have been placed in Yorkshire for forward delivery. So far as London is concerned, manufacturers here do not appear to be quoting. Business was reported early in the week as having been done at 32s.; but makers now would probably ask more than this for forward delivery.

The average values during the week were: Tar, 17s. 6d. to 22s. 6d.; pitch, London, 32s. to 32s. 6d.; east coast, 31s. 6d. to 32s. 6d.; west coast, 29s. 3d. to 29s. 9d. Benzol, 90 per cent., 10½d.; 50-90 per cent., 9¾d. to 10d. Toluol, 10¾d. to 11d. Crude naphtha, 3¾d. to 4d.; solvent naphtha, 10d. to 10¼d.; heavy naphtha, 10½d. to 11½d. Creosote, London, 1¾d. to 1$\frac{13}{16}$d.; North, 1⅞d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 8¼d. to 1s. 8½d. Refined naphthalene, £4 10s. to £8 10s.; salts, 15s. to 17s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been decidedly firm during the past week, although there has not been quite so much business doing. Beckton are not at all anxious to sell; but their nominal price may be taken as £13 for October-December, and £13 2s. 6d. for January-March. The South Metropolitan Company are not offering just at present; but their price remains £13 on their own special terms. In Hull, business has again been done at £12 12s. 6d. and £12 13s. 9d. for early shipment. Sales are reported in Leith at £12 17s. 6d. for prompt; but makers, as a rule, ask £13 for October-December, while they would require still higher prices to induce them to sell for the first six months of next year. In Liverpool, business is reported at £12 16s. 3d. for early shipment.

Three Great Trials.

THE PUBLIC have **Tried** our "St. Andrew" Gas Steam Radiators.

THE COPYISTS have **Tried** to imitate them.

THE IMITATIONS will be apt to sorely **Try** anybody who **Tries** *them.*

The "St. Andrew."

Introduced two years ago,
Going strong to-day.

JOHN WRIGHT & Co.,
Essex Works,
Birmingham.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Coal Conciliation Board have again postponed the consideration of the masters' proposal to reduce wages in the Federated districts by 5 per cent. This is an indication that there is hope of the reduction being avoided by the gradually improving winter trade. Another adjournment so late in the year does not speak well for the prosperity of the coal trade as a whole. The basis terms of last week are still quoted on 'Change for house coal and engine fuel.

Northern Coal Trade.

There is a very full request for coals; but the shipments have been a little interfered with by lack of steam tonnage. The demand for best Northumbrian steams is weaker; and the price is now about 8s. 10½d. to 9s. per ton f.o.b. Second-class steams are 8s. 3d. to 8s 4½d. per ton; and some of the pits that produce this class of coal have more orders in hand than usual at this time of the year. Small steams are 4s. 9d. to 5s. 6d. per ton. In the gas coal trade, the requirements are rising steadily now—both for local use and for shipment. The demand is especially good for best Durham gas coals; and the price is strongly held—the quotation for supplies of gas coals varying, according to quality, from about 8s. 3d. to 9s. per ton f.o.b. There are no heavy contracts for gas coals reported this week, but some sales are under negotiation for export next year; and for these sellers seem to want higher prices, though the advances will probably not be very great. In some cases, 2d. to 3d. per ton seems possible; but the rates of freight will influence this. Coke is firm; but gas coke is now in larger supply, and the prices vary very greatly—the gas companies who can ship part of their output having the best position. On Newcastle Exchange this week, 10s. 6d. to 11s. has been quoted for gas coke; but actual sales seem few.

Scotch Coal Trade.

The betterment which has been long looked for seems to have arrived at last. There are now distinct signs of improvement in trade. Current demands, it is reported, are fully meeting the outputs; and higher prices are being asked for forward delivery. The prices quoted are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s., and splint 8s. 9d. to 9s. The shipments for the week amounted to 280,608 tons—an increase of 54,978 tons upon the preceding week, and of 24,648 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,635,038 tons—an increase of 477,611 tons upon 1904.

The Directors of the Monte Video Gas Company, Limited, have declared an interim dividend of 6s. per share, less income-tax, for the half year ended the 30th of June.

Inspection of the Oldham Gas-Works.

The annual inspection of the Oldham Gas-Works by members and officials of the Town Council and of the Councils of the outlying districts in the area of supply took place on Friday, when the various processes were explained by the Manager (Mr. T. Duxbury) and other officials. At a subsequent tea, Alderman Johnson proposed "Success to the Gas Undertaking;" coupling with his toast a wish for the good health of the Chairman and the Committee. He said the progress of the undertaking was shown by the decrease in the price of gas from 5s. 2d. per 1000 cubic feet in 1854 to 2s. 3d. The Chairman (Alderman Hanson, J.P.), in reply, remarked that they had that day visited the Higginshaw and Hollinwood works; but time would not permit them to visit the other stations at Royton and Oldham. The two latter works were the smallest they had, and would probably be less worked in the future. As the machinery became worn out, the supply would come more from Higginshaw and Hollinwood. Their Higginshaw station was the most modern; and they had there the greatest amount of room for extension. Most of the machinery was quite modern, and would require very little expenditure for many years to come. At Hollinwood it was unfortunate that they had not direct communication with the railway, which was a serious disadvantage. Speaking of the water-gas plant at Hollinwood, he said certain residents in the neighbourhood imagined they had discovered some odours from it. It was possible that there had been some slight ground for complaint; but the Committee had spared no pains or expense in trying to obviate any nuisance. The plant had rendered excellent service, especially in helping to tide over difficulties of fog and dark days. It was more than fifty years since the Corporation took over the gas undertaking; and he thought it was a very wise policy. As compared with 1854, the gas manufactured was now twelve times as much, and the number of consumers 25 times as many. The price was very low; there being comparatively few towns in the kingdom where the average charge was lower. The growth of the incandescent system of gas lighting had had the effect of lessening the demand for illuminating purposes; but this had been met by a more general demand for cooking. The output at the present time was larger than ever before.

Fatal Fall from a Gasholder at St. Helens.—An inquest has been held on the body of an apprentice engineer named Leonard Kerton, who sustained fatal injuries through falling from a gasholder belonging to the St. Helens Corporation. It was stated that Messrs. Clayton, Son, and Co., of Hunslet, were adding a new lift to the holder; and deceased, in company with a man named John Rider, was engaged bolting up the rivets. They were inside the holder, on a scaffolding about 27 feet from the ground. Deceased was about to take a bolt out above him, which he could reach easily. He stepped backwards, and fell to the ground. He was picked up unconscious and taken to the hospital, where he died the same night. A verdict of "Accidental death" was returned.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ltd.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1393, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

New Water Supply for Holyhead.—The Holyhead Water Company have decided to acquire the rights of utilizing Traffwyll Lake for water supply purposes, as the reservoirs on Holyhead Mountain have been found inadequate to meet the growing demands of the town. The lake (which is 2½ miles in circumference) is situate about 6½ miles from Holyhead; and the estimated cost of the scheme is £20,000.

Aberavon Gas Supply.—The accounts of the Aberavon Corporation, for the year ended the 31st of March, have just been published. Recently the Town Council appointed a Borough Accountant, and he has overhauled the whole of the accounts, and, as regards the gas, water, and market undertakings, has placed them on the footing of "income and expenditure" accounts. This has had the effect this year of bringing thirteen months' expenditure into the working of the gas accounts, which show, under the circumstances, a net loss of £98. Taking the twelve months' expenditure by itself, a net profit of £330 has been earned. The coal carbonized was 2670 tons, which produced 27,843,000 cubic feet of gas; being an increase of 1,746,000 cubic feet for the year. The gas sold shows an augmentation of 7 per cent. over the preceding twelve months.

Automatic Meters at Beccles.—The Richmond Gas Stove and Meter Company, Limited, have just completed the fitting up, for the Beccles Gas and Water Company, of 82 houses on the automatic system. Gas is supplied at the rate of 17 cubic feet for 1d.; and as this is a comparatively high price, it was decided to put in a packed and enamelled cooker. For the same reason a Welsbach incandescent burner was supplied with the two brackets and pendant, which completes the installation. The incandescent burner is much appreciated; numbers of consumers having bought extra burners. The original intention was to fit up 40 houses; but the business has grown to the dimensions stated. The whole is the result of an exhibition held in the Town Hall in June. The services were all laid by the Gas Company; and the inside work was carried out, under the superintendence of Mr. Butler, in a most satisfactory manner.

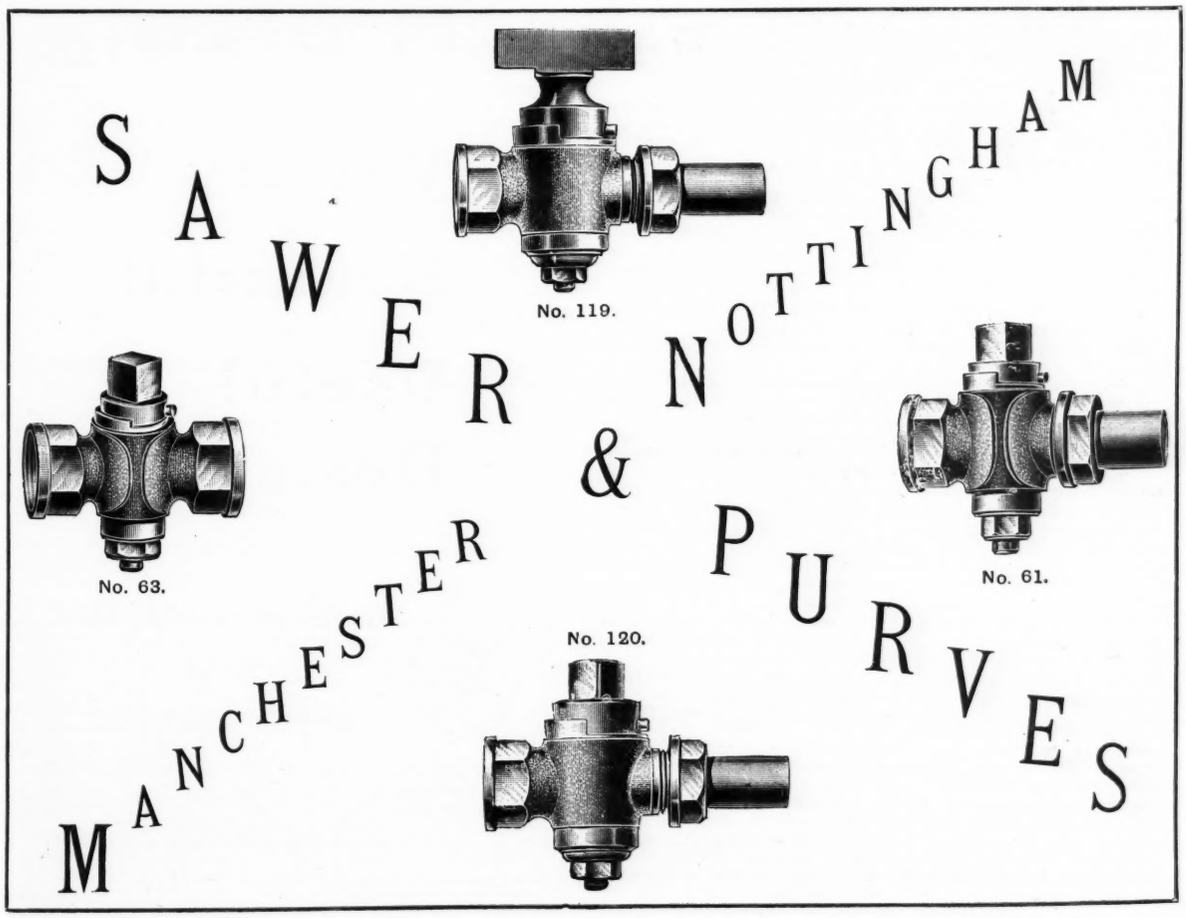
Charge for Gas for the High-Pressure Refuge Lamps in Westminster.—The Works Committee of the Westminster City Council reported on Tuesday having received a letter from the Gaslight and Coke Company offering to supply gas to the high-pressure lamps on the refuges in Parliament Street and Whitehall at a scale of charges, instead of by meter as at present. The lamps erected by the Company in Parliament Square and in Parliament Street referred to are supplied through the same compressor, and in the communication it was explained that the proposal was made in order to avoid the calculation of the gas consumption, which would be unsatisfactory to the municipal authority and to the Company. The Committee had decided (subject to the usual sanction) that the gas supplied to the refuge lamps should be paid for on a scale; the annual charge for gas for a single-burner lamp to be £4 5s. 4d., and for a double-burner lamp £8 10s. 9d., in addition to an allowance of 20 cubic feet per hour in respect of the gas used by the compressor.

Padiham Gas Supply.—At last Thursday's meeting of the Padiham Urban District Council, it was decided to make the system of incandescent lighting general throughout the district. The time was not considered opportune for giving a preferential rate to consumers of gas for power purposes.

Assessment of the Nantwich Gas-Works.—The Nantwich Urban District Council have resolved to appeal against the new assessment of the gas-works. The old figures were £840 gross and £420 net; but these have now been raised to £1500 and £1000 respectively. Taking the present rates as a basis, this means that, if the appeal is unsuccessful, the department will have to pay £350 a year, instead of £150.

Duty of Protecting Public Gas-Lamps.—The Camborne Gas Company having had their attention drawn by the Urban District Council to the fact that several of the public lamps had been seen not lighted when they should have been, the Secretary (Mr. W. Bailey) replied that the lamplighters had not been guilty of neglect, but that boys had swarmed up the posts and put the lights out, and on many occasions had relighted the lamps after they had been extinguished at the proper time. He suggested that the Council should call the attention of the police to the matter, with a view to prosecuting any boy seen climbing a lamp-post. When the matter came before the Council, one of the members said he thought it would be the duty of the Gas Company to complain to the police; but the Assistant Clerk pointed out that the Council contracted to take all steps to protect the lighting. In this connection, the Council agreed to a sensible suggestion—that a letter should be written to the masters of local schools, to be read out to their scholars, warning them not to repeat their mischievous behaviour, and pointing out the penalties that might be exacted if they were caught.

Gas Explosion at Chesterfield.—As the result of a gas explosion on Monday night of last week, three persons at Chesterfield were slightly injured, while a great deal of damage was done to a house and its contents. Some weeks ago the discovery was made that there was a leakage of gas somewhere in the dining-room; and the officials of the Gas and Water Board were apprised of the fact. Mr. Worrall, the tenant, considered that a certain length of pipe should be renewed; but the Board's officials, it is said, did not think this was necessary, and the repairs were done without it. Since the work was completed, a further escape of gas had been detected at various times; but no further steps were taken to have the leakage stopped. On the Saturday preceding the accident, the occupants of the house went away for the week-end; and during their absence the tenants of the adjoining houses noticed a smell of escaping gas. On the Monday night, shortly after ten o'clock, when the tenants returned, they discovered that the rooms were full of gas, and the doors and windows were thrown open. At the end of a quarter-of-an-hour, it was considered safe to light a gas-ring in the kitchen; and some time later a pendant in the drawing-room was also lighted. As the smell of gas had passed away, it was considered all risks were at an end; but some minutes later the explosion occurred,.



Reduction in Price.—The price of gas in the St. Mary Church district of Torquay, in which the gas-works are owned by the Torquay Corporation, has been reduced by 3d. per 1000 cubic feet.

Chard Water Supply.—In consequence of the continued dry weather, the water supply at Chard is proving inadequate; and a special meeting of the Town Council was held last Wednesday to consider proposals for augmenting it. The Surveyor reported that he had been carrying out boring; but although he had gone to a depth of 30 feet, he had not discovered water, and there were fissures in the ground which would probably carry away any water if it was found. It was decided that the boring should be continued for the present; and that if water was met with the well should be lined.

Electric Wires and Fire Risks.—Another disastrous factory fire has to be added to those recently recorded as in all probability having their origin in the fusing of electric wires. On Thursday night, about a quarter of the extensive calico printing works of Messrs. Steiner and Co., Limited, at Church, were destroyed; the damage done being roughly estimated at £100,000. A huge stretching machine recently installed is operated by electric motors; and it is the wires connected with these that are strongly suspected to have been the cause of the outbreak.

Ceara Gas Company, Limited.—At the annual general meeting of this Company on Friday, the Directors will report that the result of the year's working is a net profit of £5403, which with the balance brought forward gives a total of £7126. Deducting the interim dividend paid in April last (£1388), there remains £5738 available for distribution. Out of this sum, the Directors recommend the payment of a dividend for the six months ended the 30th of June of 5 per cent. on the preference shares (less income-tax), and of 3 per cent. on the ordinary shares (tax free); making together £1688. These payments, with the interim dividend, will make 10 per cent. on the former and 5 per cent. on the latter shares for the year. The balance carried forward will be £4050.

Fire Caused by Electric Current.—According to a Laffan telegram from Vienna in the "Daily Express," extraordinary scenes occurred last Sunday morning in the death chamber of the late Don Jesus Zenil, the Mexican Minister to Austria. While the workmen were arranging the apartment as a mortuary chamber, a series of blinding flashes issued from the electric lighting apparatus, and instantly the whole room, which was richly furnished, and hung with tapestries and valuable pictures, burst into flame. At great danger to their own lives, the workmen managed to rescue the coffin containing the body. The flames spread rapidly, and the apartments of the late Minister, with nearly all their costly furniture, were consumed, and three of the firemen were seriously injured.

An Unfortunate Investment in Consols.—The Burslem Corporation find themselves in an unfortunate position in connection with the repayment of an instalment of £20,000 of their gas-works loan. It appears that the money was borrowed from the Admiralty by the old Local Board; and the Admiralty stipulated that the sinking fund for the repayment should be invested in an absolutely safe security. In consequence of this, Consols were bought, as was usual at that period; and the additions to the sinking fund were therefore continued by further purchases of Consols. A "safe" security, however, is not everything; for the decline that has meantime occurred in the value of Consols, leaves the Corporation with a deficiency of some £1400 on the purchase price, which they, of course, have to make good.

A Gas-Fitters' Association for Birmingham.—It was recently decided to form an Association, to be called the Birmingham and District Master Gas-Fitters' Association, one of the objects of which would be the protection of the united and individual interests of the master gasfitters of the neighbourhood—particularly in respect to their position in reference to the question of municipal trading. The first general meeting of the Association was held at the Bristol Street Council schools last Friday, and it was attended by upwards of 50 members. Mr. Charles Breedon was elected Chairman, and having briefly stated the objects of the Association, the rules suggested were unanimously adopted, and the Committee, with Mr. G. H. Tyler as Secretary, were re-appointed, to continue in office for the first year.

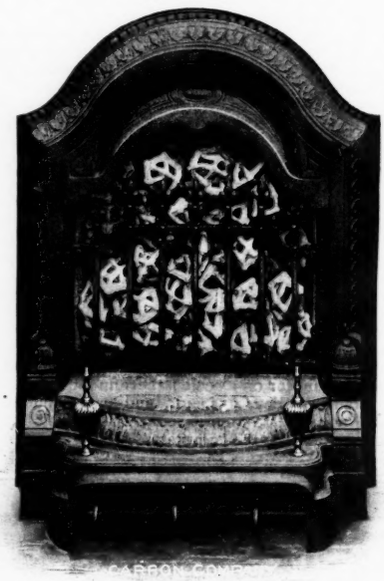
Local Authorities and the Wiring of Premises.—It will doubtless be remembered that last session, at the instance of a number of the Borough Councils, the London County Council inserted a clause in their General Powers Bill to enable local authorities to wire and fit consumers' premises for the use of electric current, and to obtain loans for the purpose. The Bill was passed by the Commons, but with a proviso that any Borough Council exercising the powers granted should so adjust their charges as to meet any expenditure, including interest upon the money borrowed and sinking-fund charges. When the Bill reached the House of Lords, the proposals in this matter were rejected altogether. Last Tuesday, the Highways Committee of the County Council reported that a number of Borough Councils had asked that the Council should revive the proposals next session; and they recommended that the scheme as approved by the House of Commons last session should be reintroduced. The Council agreed to press forward the Bill.

Death in a Bath.—The Devonport Coroner held an inquiry a few days ago in reference to the death of Frederick H. Rowe, an engine-fitter, formerly employed in H.M. Dockyard. Deceased, it appeared, had recently gone into fresh lodgings. On Sunday week he went into the bathroom intending to have a bath. About an hour later it was found that the bath was overflowing; and on the room being opened deceased was discovered lying in the bath. The water was supplied through a geyser, and was still running into the bath, while the gas was burning. A doctor who was called said the smell of gas in the house was overpowering; and his opinion was that Rowe was rendered insensible by the fumes, and, slipping into the water, was drowned. A plumber said that the geyser was all right, and was of a good make; but there was a leak in the end-pass. The bath-room had a capacity of about 339 cubic feet, and there were no means of ventilation when the window and door were closed. The Jury found that death was due to drowning, accelerated by the fumes of the gas.

CARRON

Gas

FIRES



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Gas Fumes and Stained Glass Windows.—In the course of its long existence as an illuminant, gas has had to bear the brunt of many attacks of one kind and another; and that it has done so successfully is testified by the fact that it is now more extensively used than ever. The latest charge brought against it has been at Great Malvern, where, according to a paragraph which has appeared in several newspapers, its "fumes are seriously damaging the fine old Fifteenth Century glass in the Priory Church," with the result that "a fund is to be opened for the purpose of installing the electric light." We did not know glass was so absorptive as to be liable to injury by gas "fumes." But we live and learn.

The Chelsea Borough Council have decided to substitute incandescent lighting for flat-flame burners in 44 streets, put up 16 new lamps, and alter the positions of others, at a total estimated cost of £483.

At Goole, two men, while engaged in mainlaying operations for the Urban District Council, were overcome by gas fumes. They were found unconscious, and taken to the hospital; the condition of one of them being reported as serious.

A letter has been received by the Halifax Corporation announcing that the Ossett Corporation have decided to accept their terms for a supply of water, subject to the maximum being raised from 3 to 4 million gallons per week. This modification has been agreed to by the Halifax Water Committee.

The Newcastle and Gateshead Gas Company have made a proposal to light a number of streets on the tramway routes with gas instead of electric lamps; and the Gas and Water Committee have decided to print and circulate among the members the letter containing the offer. Mr. Ernest Hatton, the Tramways Engineer and Manager, will reply to the Gas Company's suggestion; and his communication also will be circulated when received.

The Mid-Oxfordshire Gaslight and Coke Company, Limited, has been registered with a capital of £50,000, in £10 shares (2500 preference), to carry on, in the United Kingdom or elsewhere, the business of manufacturers and suppliers of gas of all kinds, coal and coke merchants, dealers in, and manufacturers of, chemicals, power and water gas, coal tar, pitch, asphaltum, ammoniacal liquor, and other residual products obtained in the manufacture of gas, &c.

It will be seen, from an announcement which appears elsewhere, that the East Sussex Gaslight, Coke, and Water Company, Limited, are inviting applications for an issue at par of 2000 6 per cent. gas and water preference shares, and 2000 ordinary shares of £5 each, and a first issue of 500 5 per cent. debentures of £10 each, redeemable at £11 per debenture in five years from the date of allotment. The Company have acquired the whole of the plant of the Natural Gas Fields of England.

The Strabane Town Hall is in need of alterations and improvements; and there being a comfortable balance of £1500 to the credit of the gas account, it has been decided that the cost of the work shall be defrayed out of this. The Clerk expressed the opinion that if any of the gas consumers opposed, the Council would not be able to carry out the suggestion; but a member pointed out that on a former occasion over £1000 had been paid for law costs out of this account, without any objection being made.

Plans have been prepared for a 20 million gallon mechanical filtration plant for the municipal water-works of Toledo (Ohio). The supply is at present drawn from the Maumee River by pumps at a station four miles above the business portion of the city, and the water is sent direct into the distribution system without purification. The filtering plant is to be built three miles up stream from the station; and it will embrace a power and pumping station on the river bank, purification works, a clear-water reservoir, and a conduit connecting the new plant with the existing pumping-station further down the river.

We have received from Messrs. J. & W. B. Smith, of Farringdon Road, E.C., their general catalogue, for the season 1905-6, of gas lamps, fittings, globes, chimneys, &c. Its contents occupy 160 pages, and show the above-named articles in great variety. Attention may be particularly directed to the firm's "Glasmi" mantles, shown on p. 25. The special qualities claimed for this mantle are strong texture and great strength, and consequently long average life, as well as high light-giving power. In inverted burners, the "Veribest," shown on p. 30, commends itself to notice, not only for the features which the makers point out in connection with their illustrations of it, but because it is of British manufacture throughout, and all parts are easily renewable. The "Empire" regenerative inverted gas-lamp and the "Universal" self-intensive incandescent gas outside lamp (wind and rain proof) are also of British make. The firm present in their new catalogue a fine show of fittings both for upright and inverted burners; while glassware is quite a speciality with them. The entire catalogue is effectively got up, and well deserves a place on a gas manager's office table.

The Association of Engineers-in-Charge, whose inspection of the Vauxhall and Kennington stations of the South Metropolitan Gas Company on the 14th inst. was noticed in the "JOURNAL" the following Tuesday, recently visited Watford, with the object of seeing the machinery in the various modern works situated in the urban district. Among others, the destructor works, which are under the care of Mr. George Day, were gone through, and their excellent condition was commented upon. The destructor is one of Meldrum's patent regenerative front-feed type, and comprises a four-grate destructor, combustion chamber, and Lancashire boiler, 30 ft. by 8 ft., for a working pressure of 120 lbs. per square inch. Some particulars were furnished as to the working of the destructor, which was started on the 2nd of April last year. The makers estimated that it would effect a saving of £900 per annum in coal. The actual saving was £893. After deducting all capital and standing charges, the net result of the first year's work was a surplus of about £200—a result which, it was stated, gave satisfaction to the Urban District Council, and of which it was thought Messrs. Meldrum Bros. had cause to be proud.

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Company Meeting.

CEARA GAS COMPANY. London Office, Oct. 27. One o'clock.

Plant, &c., for Sale.

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STATION GOVERNOR. Southgate Gas Company.
"JOURNAL" VOLS. Kershaw, Sheffield.
"JOURNAL" VOLS. No. 4483.
CLEGG'S TREATISE OF COAL GAS. No. 4489.

Investment in Water and Gas Works. No. 4478.

Stocks and Shares.

BARKING GAS COMPANY. Oct. 31.
BRISTOL WATER COMPANY. Nov. 2.
BROMLEY GAS COMPANY. Oct. 26.
COLONIAL GAS ASSOCIATION. Oct. 26.
CROYDON GAS COMPANY. Oct. 26.
EAST SUSSEX GASLIGHT, COKE, AND WATER COMPANY.
GRAYS GAS COMPANY. Nov. 14.
KINGSTON GAS COMPANY. Oct. 26.
LITTLEHAMPTON GAS COMPANY. Oct. 25.
MITCHAM AND WIMBLEDON GAS COMPANY. Oct. 26.
NORTH MIDDLESEX GAS COMPANY. Oct. 31.
READING GAS COMPANY. Oct. 30.
SOUTHEND GAS COMPANY. Nov. 7.
SOUTHEND WATER COMPANY. Oct. 31.
SOUTH METROPOLITAN GAS COMPANY. Oct. 26.
SOUTH SUBURBAN GAS COMPANY. Oct. 26.
SUTTON GAS COMPANY. Oct. 26.
WANDSWORTH AND PUTNEY GAS COMPANY. Nov. 14.
WEST KENT GAS COMPANY. Oct. 26.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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The salary will commence at £250 per Annum.
Applications, with not more than three recent Testimonials as to fitness, to be sent to me before Thursday, the 16th of November, 1905.
Canvassing in any form will disqualify.
WILL. BANTOFT,
Town Clerk.
Town Hall, Ipswich,
Oct. 19, 1905.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

WANTED, Temporary Draughtsman, accustomed to Designing Gas-Light Apparatus. Permanent position may be found for competent man.

Apply in first instance, by letter only, to JAMES KEITH AND BLACKMAN COMPANY, LIMITED, 27, FARRINGDON AVENUE, E.C.

WANTED, by a Provincial Gas Company, a smart, well-informed young man of good address as SALESMAN in the Gas-Fitting and Stove Department. Must be well up in all the newest Incandescent Burners and Gas Appliances.

Address, stating Age, previous Experience, and Salary required, to No. 4487, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REQUIRED, by a Firm of Gas Engineers, a CLERK used to making up Costs of, and preparing Accounts for, important Outdoor Jobs, Gas, Hot-Water, &c. One with Experience in Measuring up preferred. Good opening for suitable man.

Address, with full Particulars of previous Employment, stating Age and Salary expected, to "J.C.," Box 576, SELL'S ADVERTISING OFFICES, LONDON, E.C.

WANTED, at once, for Three Months only, a Young Man as GAS-FITTER, who must be Experienced in Main and Service Laying, Slot Installations, the Maintenance of Incandescent Burners (both ordinary and street lighting), and internal Gas-Fitting Work.

Wages, 25s. per week.

Apply, by letter, with Particulars and *Copies* of Testimonials, to the MANAGER, Gas-Works, WARE.

WANTED, by a large Provincial Gas Company, an Experienced WORKS MANAGER capable of taking Entire Control of Works, making Five Million Cubic feet per day. Applicants must have had considerable Experience in Regenerator Settings, Drawing and Charging Machinery, also Coal and Coke Conveying Plant. House, Coal, and Gas provided free. Age not to exceed 40 years.

Applications, by letter, stating Age, Experience, and Salary, with *copies* only of recent Testimonials, to No. 4488, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO WATER AND GAS COMPANIES REQUIRING CAPITAL.

ADVERTISER is prepared to Invest a substantial sum in a Sound and Progressive Undertaking, or would PURCHASE outright a Small Concern.

Apply, by letter, to No. 4478, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BARGAIN.—What offers for 48 Vols. of "JOURNAL OF GAS LIGHTING," &c. All clean, and in Good Condition, 1873-1898; 17 Vols. bound.

Address, Mrs. KERSHAW, 309, School Road, CROOKES, SHEFFIELD.

GAS Engineer leaving England to take up an Appointment abroad, is desirous of disposing of his set of "JOURNALS," consisting of Bound Volumes—in half leather—from 1875 to 1896, and a number of Unbound Copies. May be inspected at the "JOURNAL" Offices.

Offers to be addressed to No. 4483, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

"CLEGG'S TREATISE ON COAL GAS."

WHAT offers for a well-preserved copy of "A Practical Treatise on the Manufacture and Distribution of Coal Gas: Its Introduction and Progressive Improvement." By Samuel Clegg, junr. Third Edition, published 1859.

The book can be seen at the "JOURNAL" Offices, and offers may be addressed to No. 4489, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One 10-inch Station Governor (Braddock). Inspection may be made by appointment.

Apply to the MANAGER, Southgate and District Gas Company, New Southgate, LONDON, N.

FOR SALE, in good working condition, TWO Second-Hand GAS PURIFIERS, 8 feet by 6 feet, and 5 feet by 2 ft. 6 in. Also a 100-Light WET METER, by Glover.

Particulars from SHELDON, Engineer, WELLS.

TO BE SOLD, Gasholder, 30,000 cubic feet capacity; another 15,000 feet capacity. Both new and ready for delivery.

The WRIGHT GAS PLANT COMPANY, LIMITED, 181, Queen Victoria Street, LONDON, and SHIPLEY GATE.

CEARA GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY ANNUAL GENERAL MEETING of the Shareholders will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, in the City of London, on Friday, the 27th day of October, 1905, at One o'clock in the afternoon, to receive the Report of the Directors, to declare a Dividend, to elect a Director and an Auditor, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 14th to the 27th of October, both days inclusive.

By order of the Board,
GEORGE R. GUYATT,
Secretary.

Oct. 10, 1905.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BARKING GAS COMPANY.

NEW ISSUE OF 600 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 31st of October, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of Trustees and other Owners.
GAS AND WATER STOCKS AND SHARES
IN THE
SOUTHEND WATER-WORKS COMPANY
AND
CROMER GAS COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 31, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £20,000 NEW ORDINARY "B" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 600 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £10,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LITTLEHAMPTON GAS COMPANY, LIMITED.

ISSUE OF 400 NEW £5 SHARES.

MESSRS. SPARKS AND SON are favoured with Instructions to SELL BY AUCTION, at their Sale Rooms, 25, High Street, Littlehampton, on Wednesday, the 25th day of October, 1905, at 3.30 p.m. precisely,

400 £5 SHARES

in the above Company, in Lots of Four Shares each.

Full Particulars and Conditions of Sale may be obtained of Mr. WILLIAM BELDAM, the Company's Secretary, LITTLEHAMPTON, or at the Offices of the AUCTIONEERS at LITTLEHAMPTON or ARUNDEL.

By order of the Executors of the late Mr. J. D. Hayton.
GAS STOCKS AND SHARES
IN THE
SOUTH METROPOLITAN,
SUTTON, CROYDON, MITCHAM & WIMBLEDON,
KINGSTON-UPON-THAMES,
BROMLEY, WEST KENT,
AND
SOUTH SUBURBAN GAS COMPANIES
ALSO IN THE
COLONIAL GAS ASSOCIATION, LTD.,
and numerous well-known Industrial and other Companies.

MESSRS. MORRIS AND SANDELL will SELL BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Thursday, Oct. 26, 1905, at Two o'clock precisely (in convenient lots), Stocks and Shares as above.

Particulars may be obtained of Messrs. PENNINGTON AND SON, 64, Lincoln's Inn Fields, W.C., and of the AUCTIONEERS, Cambridge House, Farnborough, HANTS.

CROYDON GAS COMPANY.

TENDERS are invited for the Purchase of FOUR PER CENT. PERPETUAL DEBENTURE STOCK,

(in amounts of £5, or multiples thereof), to such an amount as (with the premiums to be realized on the Sale) shall produce the sum of

£23,177 13s. 2d.

The Minimum Price of issue has been fixed at

£103 per £100.

Tenders will be received up to Nine a.m. on Wednesday, the 1st of November, 1905, at the Offices of the Company, Katherine Street, Croydon.

Further Particulars, with Forms of Tender, will be sent on application.

By order of the Directors,
WILLIAM W. TOPLEY, Secretary.

NORTH MIDDLESEX GAS COMPANY.

ISSUE OF £5000 FIVE PER CENT. PREFERENCE STOCK.

THE Directors of the North Middlesex Gas Company hereby offer the above Stock FOR SALE BY TENDER, the last day for the reception of Tenders being Tuesday, the 31st of October, 1905.

Minimum price of issue, £120 per £100 Stock.

Particulars of the Sale and Forms of Tender may be had on application to the undersigned, or at the District Offices of the Company, 11, The Broadway, Church End, Finchley, and 32, Church Road, Hendon.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office:
5 and 6, Great Winchester Street,
Old Broad Street, London, E.C.
Oct. 9, 1905.

READING GAS COMPANY.
(INCORPORATED BY 25th and 26th Vic. cap. 84. 30th June, 1862.)

SALE BY TENDER OF £10,000 ORDINARY STOCK.

THE Directors invite Tenders (at not less than £105 per £100 Stock) for £10,000 ORDINARY STOCK in the above-named Company, to be raised in pursuance of the powers of "The Reading Gas Act, 1902."

This Stock will rank for a maximum dividend of 5 per cent. per annum. Full dividends on the Company's Stocks and Shares have been paid since its Incorporation in 1862.

The Stock will be issued in amounts of not less than £10 or multiples thereof, and will be registered in the names of the purchasers (or their nominees) free of expense.

Payment for the Stock is to be made by the 30th of November, 1905.

The Dividends are paid half-yearly, on the 1st of March and 1st of September.

The liability of the Stockholders is limited; that is, when the Stock is paid for there is no further liability.

Particulars, with Forms of Tender, may be obtained on application to the Secretary, to whom Tenders must be delivered not later than Monday, the 30th of October next.

By order of the Directors,
A. CANNING WILLIAMS,
Secretary.

159, Friar Street, Reading,
3rd October, 1905.

BRISTOL WATER-WORKS COMPANY.

SALE OF ORDINARY STOCK.

MESSRS. ALEXANDER, DANIEL, AND CO. will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 2nd of November, 1905, at Three o'clock in the Afternoon,

£15,000

BRISTOL WATER-WORKS 7 PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, in Lots of £100,

At the reserved price of £147 for every £100 Stock.

The above £15,000 Stock is part of the 7 per cent. Maximum Consolidated Ordinary Stock, amounting to £970,000, created under the powers of the Bristol Water-Works Acts, 1888, 1889, 1895, and 1902.

The Dividend is subject to proportionate diminution whenever the Maximum Dividend to which each class of Ordinary Shares or Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL; to Messrs. EDWARD GERRISH AND CO., Lloyds Bank Buildings, Corn Street, BRISTOL; or to

ALFRED J. ALEXANDER,
Secretary and General Manager.

Bristol Water-Works Office,
Telephone Avenue, Bristol.

THE ROYAL SANITARY INSTITUTE.

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December 12th to 15th, 1905,

IN THE
ROYAL HORTICULTURAL SOCIETY'S NEW HALL
VINCENT SQUARE, WESTMINSTER.

Heating and Cooking Appliances, Solid Fuels, Oil Fuels, Hot Water and Steam, Gas, Electricity, Testing Appliances, Domestic Destructors and Refuse Consumers, Boilers, Radiators, &c., &c.

Further Particulars and Application Forms for Space from the Offices of the INSTITUTE, 72, MARGARET STREET, LONDON, W.

GAS METERS.
SLOT METERS.
GEYSERS.
COOKERS.
STOVES.
WORKSHOP LAMPS.
GAS IRONS.
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FITTINGS.

CENTRAL WORKS in DESSAU
OF THE
GERMAN CONTINENTAL GAS ASSOCIATION
(Deutsche Continental Gas Gesellschaft).
For Illustrated Price Lists and full Particulars apply to our SOLE AGENTS FOR THE UNITED KINGDOM AND COLONIES:
THE INCANDESCENT LIGHTING & MANTLE INSURANCE CO.,
57/58, CHANCERY LANE, LONDON, W.C.
Telephone: 12788 CENTRAL. Telegrams: "FRAENKL, 58, CHANCERY LANE."

GUARANTEED SIX PER CENT.
PREFERENCE AND ORDINARY SHARES
IN THE
EAST SUSSEX GAS LIGHT, COKE, & WATER COMPANY, LTD.

Issue of 6 Per Cent. Preference Shares, Ordinary Shares, and 5 per Cent. Debentures, redeemable at a Premium of 10 Per Cent.

NOTICE IS HEREBY GIVEN, that the Directors are proceeding to issue the above STOCK and SHARES.

Prospectus and Forms of Application are obtainable at London and County Banking Company, Ltd, Hastings (and all Branches), the Gas and Water Debenture Trust, Ltd., 37, High Street, Tunbridge Wells, and the Company's Office, 99, Cannon Street, London, E.C.

By order of the Directors,
A. W. LUNT, Managing-Director.
B. CLARK, Secretary.

GILBERT LITTLE & CO., LTD.
Conveyor and Elevator Specialists,
Smethwick, Birmingham.
Make known your wants for Conveyors and Elevators to GILBERT LITTLE, the Pioneer Specialist; he will supply them.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

Gas Companies are solicited to try Samples of the
MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Prices and analysis on application.
The MIRFIELD (GAS-COAL) COLLIERIES CO., RAVENSTHORPE, NEAR DEWSBURY.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE
"ROTARY" STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
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JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE LIMITED,
FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: H. CRESSWELL & CO., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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NEWBATTLE COLLIERIES,
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'BUFFALO' INJECTOR

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SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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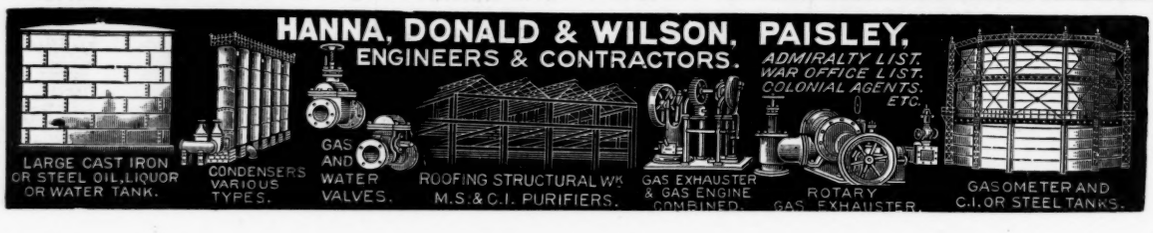
90, CANNON STREET, E.C.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ADMIRALTY LIST.
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LARGE CAST IRON OR STEEL OIL, LIQUOR OR WATER TANK.
CONDENSERS VARIOUS TYPES.
GAS AND WATER VALVES.
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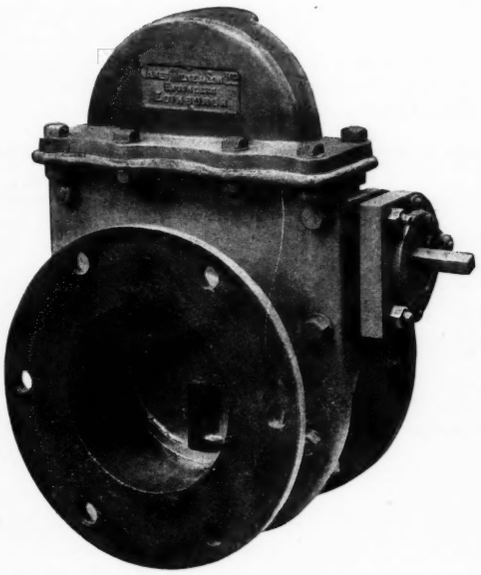
GAS EXHAUSTER & GAS ENGINE COMBINED.
ROTARY GAS EXHAUSTER.
GASOMETER AND C.I. OR STEEL TANKS.

RACK & PINION GAS VALVES

USUAL SIZES IN STOCK.

FACES MACHINED THROUGHOUT.



Valves and Seats Hand-Scraped.

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15 lbs. per square inch.

MADE BY

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Also at LONDON, GLASGOW, and LEEDS.

IF YOU WANT

TO SEE 'STARS'

INVERTED,

Try the 'INVERTED'

STAR BURNER

A CROWN OF LIGHT FOR HALF A CROWN.

No. 4 Midget Burner and Mantle.

WRITE FOR CATALOGUE & DISCOUNTS.

The "STAR"

Inverted Incandescent Burner Co., Ld.,

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ARROL-FOULIS

Patent Automatic Machinery

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DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

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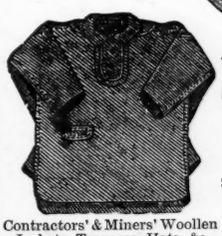
[See Illustrated Advertisement, Oct. 3, p. 10.]

THOMAS BUGDEN,

India Rubber, Guttapercha, Air-proof, and . . Waterproof Manufacturer.

GAS ENGINE BAGS



All Seams Stitched and Taped.

ORIGINAL MAKER OF

GAS BAGS FOR MAINS,

Round or Cylinder shape.

Diving and Wading Dresses, Gas Engine Bags, Sewer Boots, Tar Hose, Leather Machine Bands. Stokers' Mitts, Bellows, &c.

Sewer & Fireman's Boots.

Contractors' & Miners' Woollen Jackets, Trousers, Hats, &c.

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ENGINEERS,
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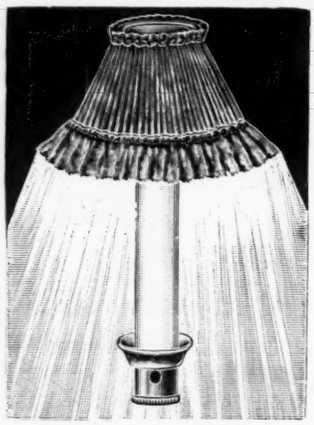
LIME & OXIDE ELEVATORS & CONVEYORS.
COAL AND COKE STORAGE PLANTS.
Coal and Coke Elevators and Conveyors.
STAMPED AND RIVETTED STEEL ELEVATOR BUCKETS.
DETACHABLE CHAINS AND SPROCKET WHEELS.
HIGH-CLASS STEAM ENGINES. BEAM PUMPING-ENGINES, &c.



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THE
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GAS-LIGHT CANDLE.
The most decorative Gas-Light ever offered.
A perfect combustion Burner.
Cannot get out of order.
60-Candle Power with 2½ cubic feet of Gas.
Can be used anywhere instead of a "C" Burner.
Address of your nearest Wholesale Factor will be sent on application to No. 4374, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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THOMAS VALE & SONS, LTD.,
Contractors, STOURPORT.
CARBONIZING WORKS.
KLONNE SETTINGS A SPECIALITY. High-Class Work Only.

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MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

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THE SEVENTH EDITION OF
NEWBIGGING'S HANDBOOK
FOR GAS ENGINEERS AND MANAGERS
(DEDICATED TO SIR GEORGE LIVESEY).
The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.
In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.
Orders may be sent through any Bookseller, or direct to the Publisher,
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

IMPORTANT NOTICE.

It is the practice of the "Gas World" to publish from time to time analyses of the accounts of Gas Undertakings in this Country. A number of such analyses appeared in the issue for September 16, and they show that at Fenton, Longton, Rotherham, and Tipton, some of the highest results were obtained in Gas Made and Coke Sold.

It may be interesting to Gas Engineers to learn that at these four places Winstanley's Settings are in use.

The Winstanley Speciality Company, Newton Chambers, Cannon Street, Birmingham.

THE LEEDS FIRECLAY CO., LTD.,
CLIFF'S BRAND.
INGHAM'S BRAND.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.
Patent MACHINE-MADE RETORTS
These Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made. *Retorts carefully Packed for Export.*
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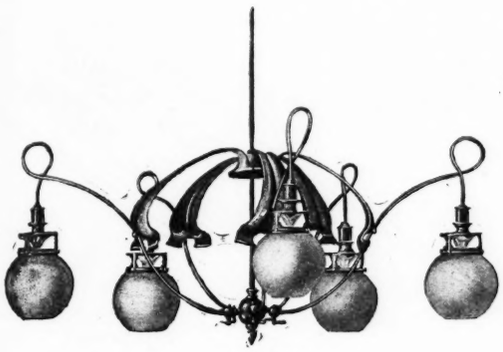
LEEDS: 20, Park Row. LIVERPOOL: 21, Leeds Street.

THE ORIGINAL
NEW INVERTED BURNERS.

ARTISTIC! ECONOMICAL!



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All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

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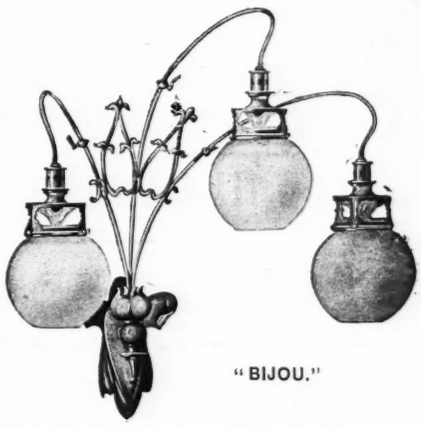

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The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-tenth the cost.

No. 2 Burner.

New Season's Catalogue Now Ready.

Cluster Lamp. Fig. 6.

AN IDEAL LAMP FOR SHOP LIGHTING, WAREHOUSES, FACTORIES, PUBLIC BUILDINGS, and OUTSIDE LIGHTING.

The New Inverted Incandescent Gas Lamp Co., Ld.

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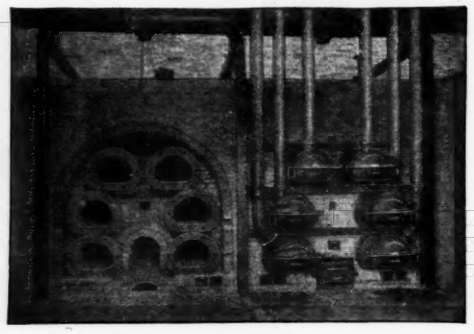

PHOTO. OF REGENERATOR SETTINGS DURING CONSTRUCTION.

REGENERATOR & GENERATOR SETTINGS

DEEP, SEMI-DEEP, AND SHALLOW.

Maximum Make per Ton and Mouthpiece.

Minimum Fuel Consumption.

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Have been received for each of the above types of Settings.

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JÄGER GRIDS CAPACITY OF PURIFIERS DOUBLED. PRESSURE CONSIDERABLY REDUCED.

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Every Requirement for Gas-Works.

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RADIATE MORE HEAT

BY USING

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SILCO BRICKS prevent all settling of setting.

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9 Modern Maxims 9

"You do not want light to show, but light to see by"

In other words, lighting is primarily a matter of utility. The fundamental test of a lamp is its usefulness. To be useful implies abundance of pleasing light, simplicity in handling, and economy of up-keep. All these qualities are possessed by the Lucas Light, the most serviceable system of high-power lighting in existence.

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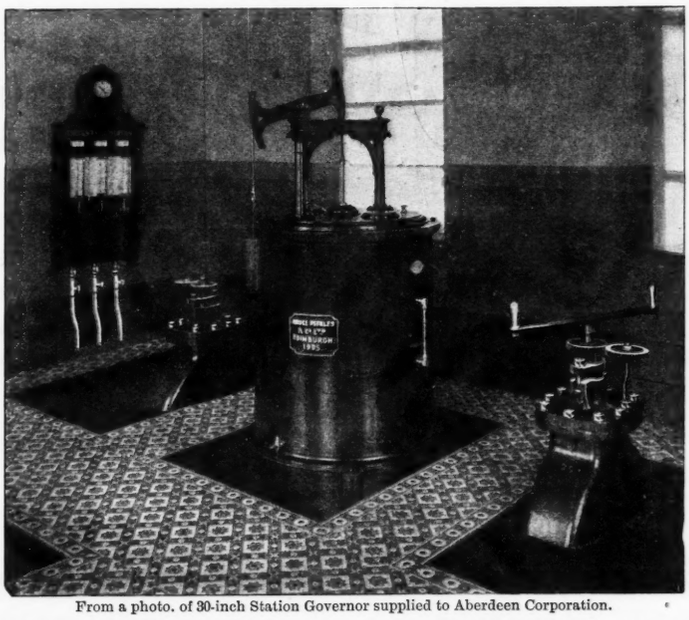
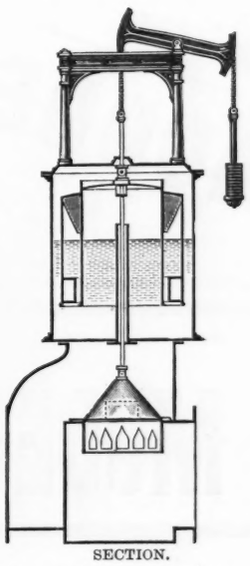
The result of many years' varied experience in their design and manufacture, they effectually Control Pressure under the most exacting conditions.



From a photo. of 30-inch Station Governor supplied to Aberdeen Corporation.



SECTION.

The Bell is enclosed and in communication with the outlet of the Governor, thus responding to the slightest variation in outlet Pressure. Small weights are conveniently placed for operating the Governor, or "The Peebles' System of Air-Loading" from a distance may be employed. All Governors are carefully tested before being dispatched, and the material and workmanship is of the best possible description.

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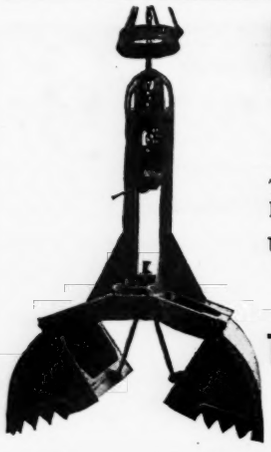

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APPLICABLE TO ANY ORDINARY SINGLE CHAIN CRANE.

These Grabs are unequalled for handling Coal, Coke, Ballast, Sand, Macadam, Ores, &c., effecting in all cases very substantial savings.

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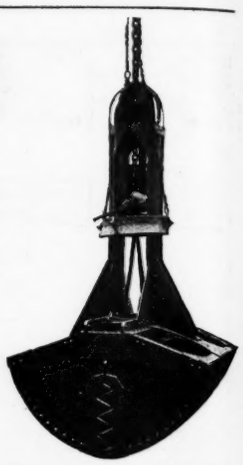

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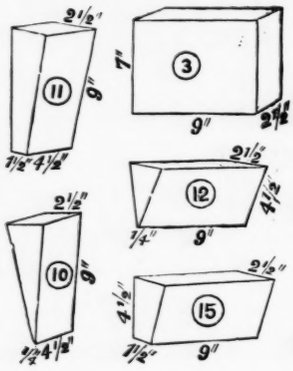
Contractors to a large number of the Principal Gas-Works.



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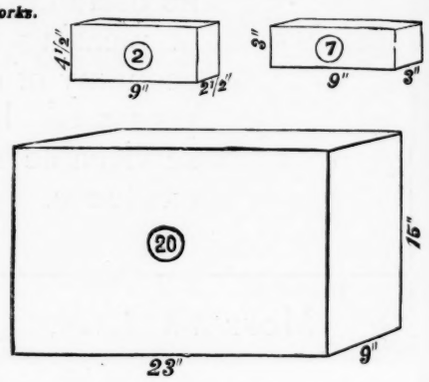
SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



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Personal attention given to all orders.

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SPECIALS FOR WATER GAS PLANTS.

CHECKER BRICKS ALWAYS IN STOCK.

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Midland Iron-Works:
DONNINGTON, near NEWPORT, SALOP.

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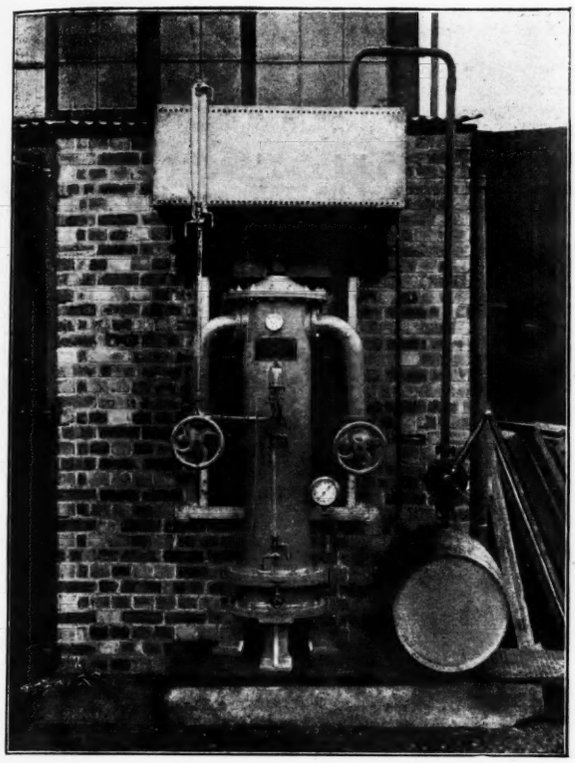

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RELIABLE, PERMANENT, AND INSTANTANEOUS ENRICHMENT.

Dispenses with the use of Expensive Cannel.

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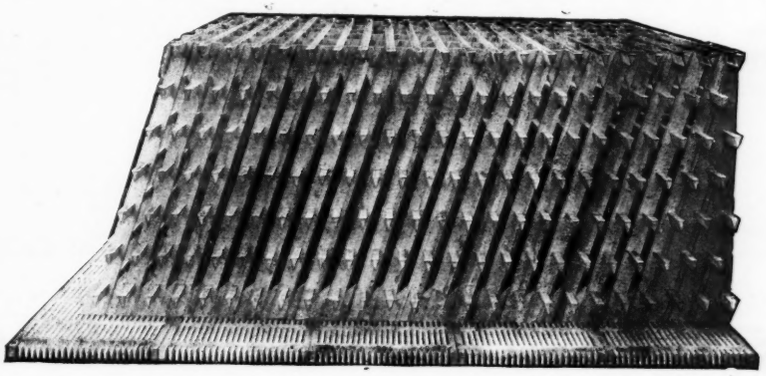
SPENCER'S PATENT HURDLE GRID

The very best Patent Grid on the Market for Holding Oxide Lightly,

And Holding Oxide Lightly is the Secret of Success for Better Purification.

No Extra Cost in adopting this system to existing Purifiers.

They are Self-Supporting, saving the cost of Standards and Bearers.



Can make the Change from the Old to the New System without any Stoppage.

Simple in Construction and very easy to fix in Position.

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3—Purifiers run much longer, Back pressure greatly reduced.
4—Purification much Improved at 25 per cent. less cost than by any other Patent method.

P.S.—My Patent is no Infringement of any other Patents.

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CONTRACTORS FOR
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EITHER ON
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Photograph showing West's Coke-Conveyor dealing with the Coke from Nineteen Through Beds of Retorts.

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR

With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

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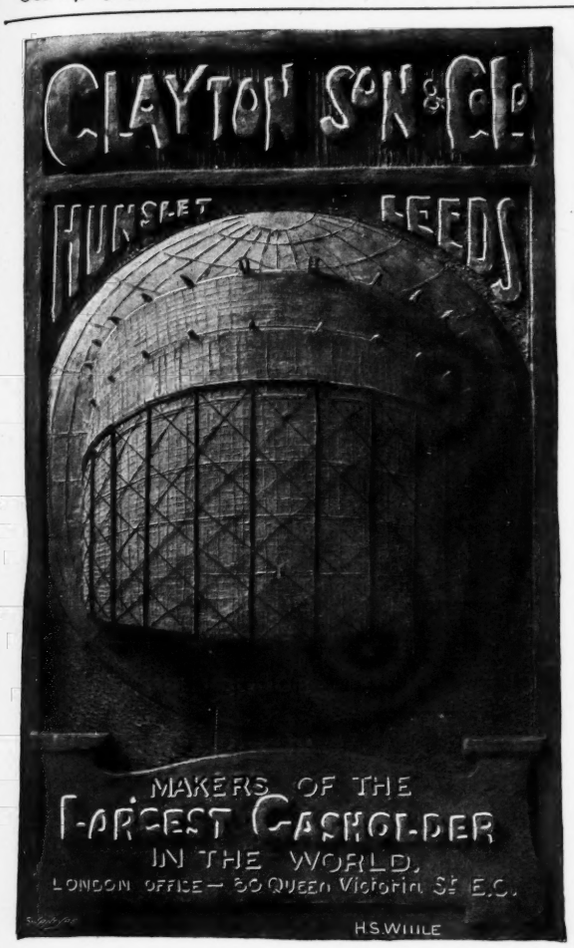

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including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

WELDLESS STEEL SPIGOT & FAUCET PIPES
for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 40 feet.

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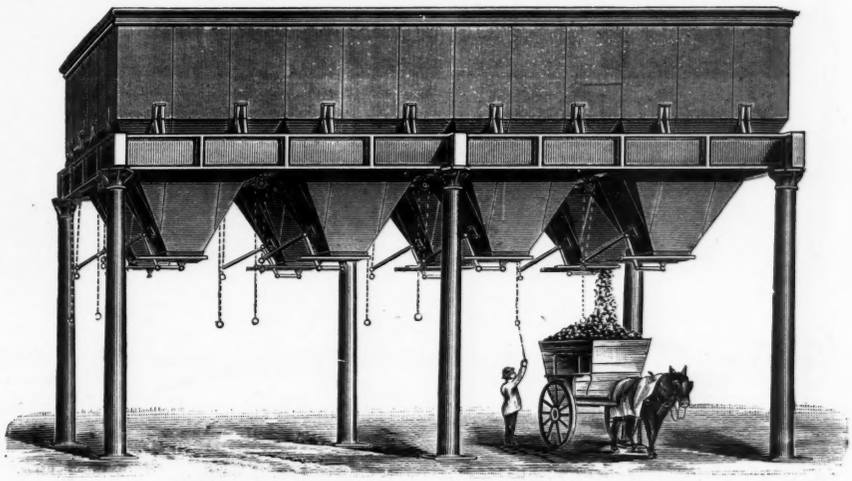

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Cheapest and most effective Burner made.

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R. LAIDLAW & SON,

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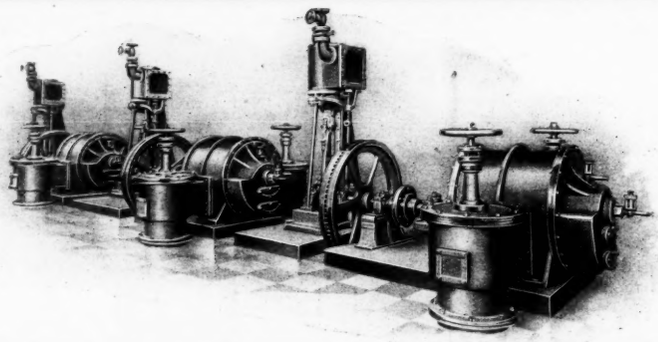
GAS & WATER ENGINEERS.



THREE SETS OF VERTICAL STEAM ENGINE & EXHAUSTER TOTAL CAPACITY 210 000 CUB. FT. OF GAS PER HOUR AT 60 REVS PER MINUTE SUPPLIED & ERECTED AT PORTSEA GAS WORKS.

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FIVE GOOD POINTS.

1.—Each Heater is complete in itself and can be put anywhere. No Boiler, Tank, or Pipe required.

2.—Gas connection only necessary.

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4.—Automatic Valve regulates the heat and maintains it at an even temperature, and thus economizes gas to a minimum consumption.

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For

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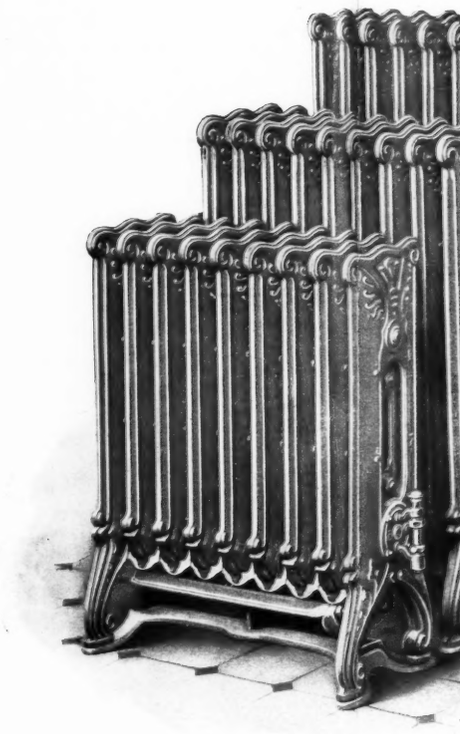


Comparative Heights—Nos. 2619,

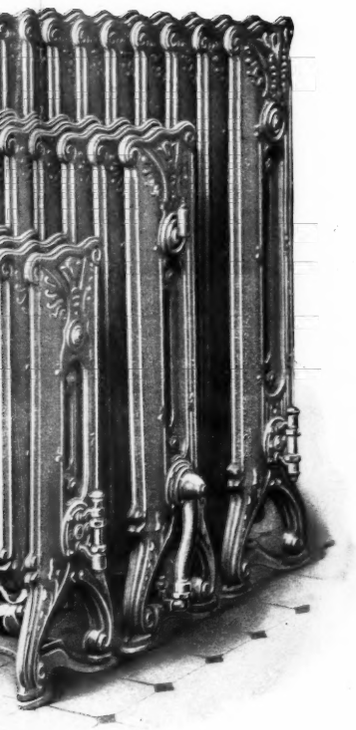
	27½ inches high.				33	
List No.	2613	2615	2617	2619	2623	2
No. of Loops	3	5	7	9	3	
Width	11 in.	16½ in.	21½ in.	27 in.	11½ in.	16
Depth of Loops, *Top Ornament* (front to back)	9 in.	9 in.	9 in.	9 in.	9 in.	9
Depth of Legs (front to back)	11½ in.	11½ in.	11½ in.	11½ in.	11½ in.	11
PRICE	42 6	71 -	91 -	112 -	46 6	7
Gas Consumption (to keep Radiator at 216° F.)	5 ft.	9 ft.	12 ft.	15 ft.	5½ ft.	9
Surface area of Tubes	sq. ft. 10½	sq. ft. 17	sq. ft. 24	sq. ft. 31	sq. ft. 13	sq

Includes Automatic Supply Valve and

Supplied in the following Colours—Black, Green,

When no Colour stated, BLAC

RCH" GASTEAM RADIATORS.



—Nos. 2619, 2629, and 2639.

.	33½ inches high.				39½ inches high.			
2619	2623	2625	2627	2629	2633	2635	2637	2639
9	3	5	7	9	3	5	7	9
27 in.	11½ in.	16½ in.	21½ in.	27 in.	11½ in.	16½ in.	21½ in.	27 in.
9 in.	9 in.	9 in.	9 in.	9 in.	9 in.	9 in.	9 in.	9 in.
11½ in.	11½ in.	11½ in.	11½ in.	11½ in.	11½ in.	11½ in.	11½ in.	11½ in.
112 -	46 6	77 -	99 6	123 -	51 6	85 -	111 -	138 -
15 ft.	5½ ft.	9½ ft.	12½ ft.	15½ ft.	6 ft.	10 ft.	13 ft.	16 ft.
sq. ft. 31	sq. ft. 13	sq. ft. 21½	sq. ft. 30	sq. ft. 39	sq. ft. 15½	sq. ft. 26	sq. ft. 36	sq. ft. 47

ly Valve and Patent Air Valve.

For

CHURCHES,

CHAPELS,

SHOPS,

OFFICES,

HALLS,

CORRIDORS,

Etc.

k, Green, Chocolate, or Red—No Extra Charge.

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"MONARCH"

GASTEAM RADIATORS.

An ornamental and decorative series of Radiators **IN ADVANCE OF ANYTHING YET PRODUCED.** The Radiators can be fitted with either luminous or atmospheric burners. The burner may be lighted from either side, thus making the Radiator adaptable to any position of gas supply. Complete with all latest improvements, and in every way **safe, reliable, and efficient.** NO FLUE REQUIRED.

USEFUL HINTS:

Height.	No.	No. of Double Loops.	Average Consumption Per Hour to keep Radiator at 216° F.	Heating Surface.	Approximately, will heat spaces as follows:					
					Schools.	Shops.	Living Rooms.	Halls, &c.	Public Buildings.	Factories and Workshops.
				Sq. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.
27½ INCHES.	2613	3	5 ft.	10½	1400	2100	1050	1400	2362	2625
	2615	5	9 ft.	17½	2330	3500	1750	2330	3937	4375
	2617	7	12 ft.	24	3200	4800	2400	3200	5400	6000
	2619	9	15 ft.	31	4130	6200	3100	4130	6975	7750
33½ INCHES.	2623	3	5½ ft.	13	1730	2600	1300	1730	2925	3250
	2625	5	9½ ft.	21½	2815	4300	2150	2815	4837	5375
	2627	7	12½ ft.	30	4000	6000	3000	4000	6750	7500
	2629	9	15½ ft.	39	5200	7800	3900	5200	8775	9750
39½ INCHES.	2633	3	6 ft.	15½	2066	3100	1550	2066	3487	3875
	2635	5	10 ft.	26	3466	5200	2600	3466	5850	6500
	2637	7	13 ft.	36	4800	7200	3600	4800	8100	9000
	2639	9	16 ft.	47	6266	9400	4700	6266	10,575	11,750

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